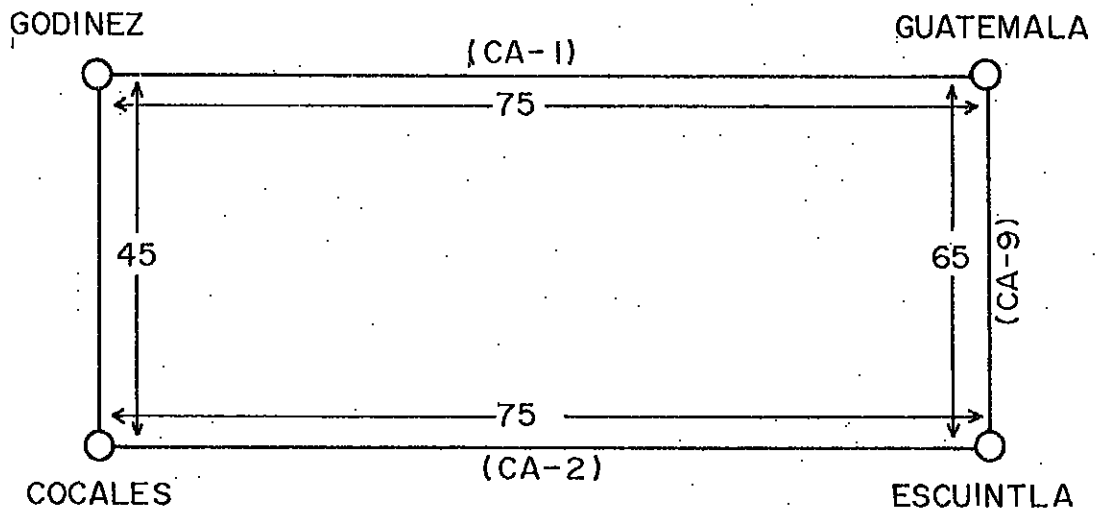


(A) Traveling Distance (Km)



(B) Mean Running Speed of Vehicles (Km/hr)

Fig. 6-2 TRAVELING DISTANCE AND MEAN RUNNING SPEED OF VEHICLES

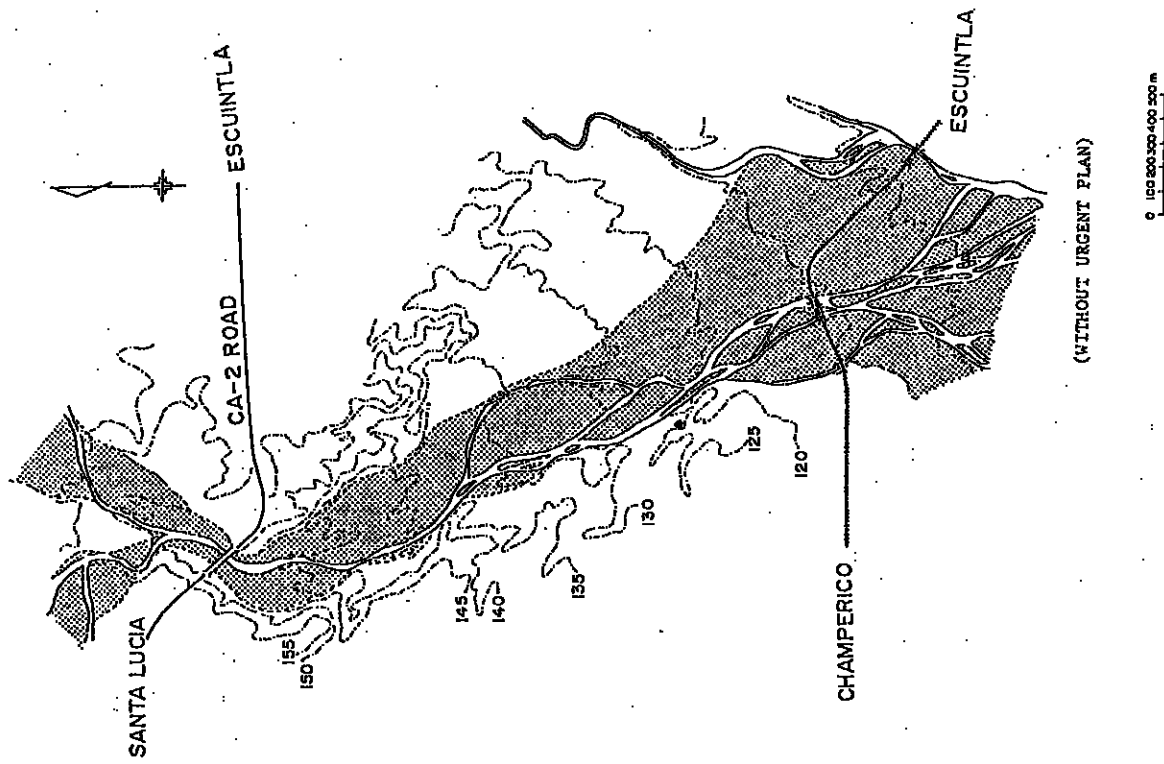
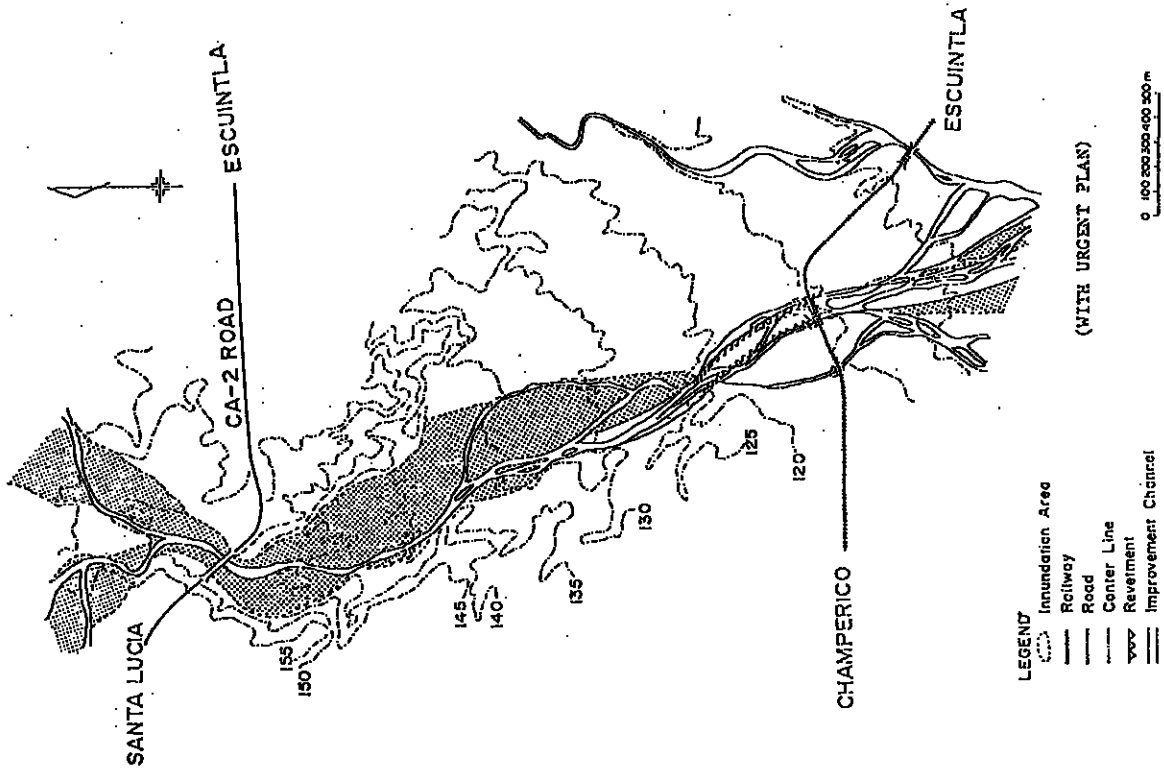
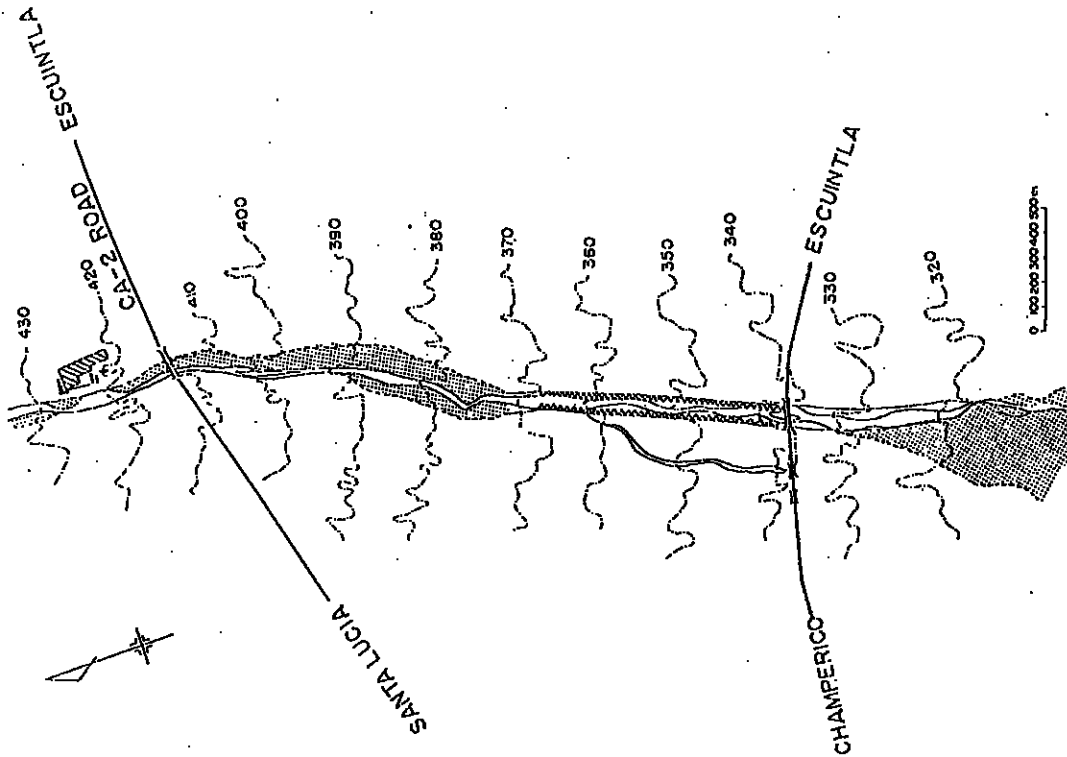
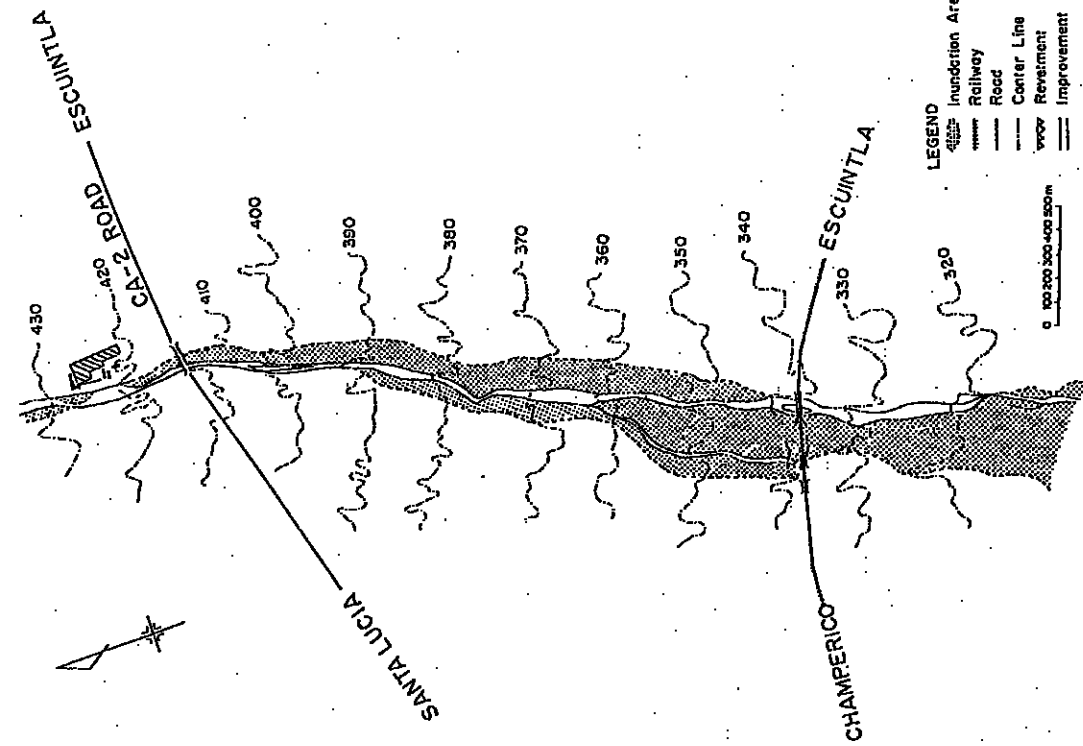


Fig. 6-3 (1/2) COMPARISON OF INUNDATION AREAS WITH AND WITHOUT URGENT PLAN (ACHIGUAGUE RIVER)



(WITH URGENT PLAN)



(WITHOUT URGENT PLAN)

Fig. 6-3 (2/2) COMPARISON OF INUNDATION AREAS WITH AND WITHOUT URGENT PLAN (PANTALEON RIVER)

7 RIVER ADMINISTRATION

RIVER ADMINISTRATION

TABLE OF CONTENTS

	<u>Page</u>
1. GENERAL	7-1
2. WATER MANAGEMENT IN GUATEMALA	
2.1 Government Machinery	7-1
2.1.1 The Central Government	7-1
2.1.2 The Local Government	7-2
2.2 Agencies Concerned in Water Management	7-2
2.2.1 Flood Prevention	7-3
2.2.2 Water Supply	7-4
2.2.3 Research and Environmental Conservation	7-5
2.3 Outline of Each Agency	7-5
3. WATER MANAGEMENT LAWS IN GUATEMALA	
3.1 Existing Laws on Water Management	7-10
3.2 Draft of "Ley de Aguas"	7-10
4. INTRODUCTION OF WATER MANAGEMENT SYSTEM AND RELEVANT LAWS IN FOREIGN COUNTRIES	
4.1 Water Management System in Foreign Countries	7-11
4.1.1 Japan	7-11
4.1.2 The United States of America	7-13
4.1.3 The United Kingdom	7-16
4.2 Laws Related to Water Management in Foreign Countries	7-17
4.2.1 Japan	7-17
4.2.2 The United States of America	7-19
4.2.3 The United Kingdom	7-20

LIST OF TABLES

	<u>Page</u>
Table 7-1 BUDGET OF GOVERNMENTAL AGENCIES IN GUATEMALA	7-23
Table 7-2 DISTRIBUTION OF BUDGET BY SECTOR IN GUATEMALA	7-24
Table 7-3 ACTIVITIES OF AGENCIES CONCERNING WATER MANAGEMENT IN GUATEMALA	7-25
Table 7-4 PRINCIPAL LAWS CONCERNING WATER MANAGEMENT IN GUATEMALA	7-28
Table 7-5 CONTENTS OF WATER MANAGEMENT BY MINISTRIES IN JAPAN	7-29
Table 7-6 CONTENTS OF RIVER ADMINISTRATION BY DIFFERENT DIVISION OF THE RIVER BUREAU OF THE MINISTRY OF CONSTRUCTION	7-31
Table 7-7 MAJOR FEDERAL AGENCIES AND THEIR RESPONSIBILITY FOR WATER MANAGEMENT IN THE UNITED STATES OF AMERICA	7-33
Table 7-8 CONTENTS OF WATER MANAGEMENT BY AGENCIES IN THE UNITED KINGDOM	7-35
Table 7-9 MAJOR ACTS RELATED TO WATER MANAGEMENT IN JAPAN	7-37
Table 7-10 MAJOR ACTS RELATED TO WATER MANAGEMENT IN THE UNITED STATES OF AMERICA	7-38
Table 7-11 MAJOR ACTS RELATED TO WATER MANAGEMENT IN THE UNITED KINGDOM	7-39

LIST OF FIGURES

	<u>Page</u>
Fig. 7-1	MANAGEMENT ORGANIZATION OF THE GOVERNMENT OF GUATEMALA 7-40
Fig. 7-2	ORGANIZATION CHART OF THE MUNICIPAL GOVERNMENT OF ESCUINTLA 7-41
Fig. 7-3	WATER MANAGEMENT AGENCIES IN GUATEMALA AND THEIR INTERRELATION 7-42
Fig. 7-4	ORGANIZATION CHART OF CAMINOS 7-43
Fig. 7-5	ORGANIZATION CHART OF FEGUA 7-44
Fig. 7-6	ORGANIZATION CHART OF DIGESA 7-45
Fig. 7-7	ORGANIZATION CHART OF DIRYA 7-46
Fig. 7-8	ORGANIZATION CHART OF INDE 7-47
Fig. 7-9	ORGANIZATION CHART OF CONE 7-48
Fig. 7-10	ORGANIZATION CHART OF DGOP 7-49
Fig. 7-11	ORGANIZATION CHART OF INFOM 7-50
Fig. 7-12	ORGANIZATION CHART OF UNEPAR 7-51
Fig. 7-13	ORGANIZATION CHART OF DGSS 7-52
Fig. 7-14	ORGANIZATION CHART OF EMPAGUA 7-53
Fig. 7-15	ORGANIZATION CHART OF XAYA-PIXCAYA 7-54
Fig. 7-16	ORGANIZATION CHART OF INSIVUMEH 7-55
Fig. 7-17	ORGANIZATION CHART OF INAFOR 7-56
Fig. 7-18	ORGANIZATION CHART OF GIM 7-57
Fig. 7-19	ADMINISTRATIVE ORGANIZATION RELATED TO WATER MANAGEMENT IN JAPAN 7-58
Fig. 7-20	ORGANIZATION CHART OF THE MINISTRY OF CONSTRUCTION WITH BREAKDOWN OF ITS RIVER BUREAU 7-59
Fig. 7-21	ADMINISTRATIVE ORGANIZATION RELATED TO WATER MANAGEMENT IN THE UNITED STATES OF AMERICA 7-60
Fig. 7-22	ORGANIZATION CHART OF THE NEW ENGLAND RIVER BASIN COMMISSION 7-61

Fig. 7-23	ORGANIZATION CHART OF THE OFFICE OF THE CHIEF OF ENGINEERS	7-62
Fig. 7-24	ORGANIZATION CHART OF THE DIRECTORATE OF CIVIL WORKS	7-63
Fig. 7-25	ADMINISTRATIVE ORGANIZATION RELATED TO WATER MANAGEMENT IN THE UNITED KINGDOM	7-64
Fig. 7-26	OPERATIONAL ORGANIZATION OF THE SEVERN TRENT WATER AUTHORITY	7-65

1. GENERAL

Water administration covers rivers, seacoasts, sediments, environments, etc., and its management items, in general, are as follows:

- (a) Flood control;
- (b) Water resources development;
- (c) Arrangement of water utilization;
- (d) Debris control;
- (e) Flood forecasting, warning, and defense activities;
- (f) Seacoast preservation;
- (g) Environment conservation; and so on.

In Guatemala, there does not seem to exist an integrated government agency performing the nationwide water administration. Various agencies are individually in charge of management for river water utilization as well as restoration works of damages caused by flood and sediment discharge.

This chapter deals with the functions and activities of the agencies in charge of water management and the related laws in Guatemala. The water management system in foreign countries, such as Japan, the United States of America and the United Kingdom, are also briefly discussed for reference in the establishment of a new system in Guatemala.

2. WATER MANAGEMENT IN GUATEMALA

2.1 Government Machinery

The Republic of Guatemala and its people are governed by three branches of execution, legislation and judicature. The administrative functions are vested in the Executive Branch which is headed by the President of the Republic of Guatemala who represents the nation and acts with his Ministers, either separately or jointly.

The Central Government

The Central Government of Guatemala resides in Guatemala City, and its organization includes eleven (11) ministries which are divided into directions having specific functions. Agencies that function as corporations or institutions have also been established as decentralized agencies under the ministries. These agencies are afforded budgetary assistance from their respective ministry, and their programs are implemented with the approval of the ministry to which they belong. (Refer to Fig. 7-1.)

The executive organization includes eleven (11) ministries which are divided into directions having specific functions. Agencies that function as corporations or institutes have also been established as decentralized institutions under the ministries. These agencies are afforded budgetary assistance from their respective ministry, and their programs are implemented with the

approval of the ministry to which they belong. (Refer to Fig. 7-1.)

The annual national budgets of Q1,465.7 million, Q1,481.4 million and Q1,314.3 million have been drawn up in 1981, 1982 and 1983, respectively. These national budgets were apportioned to the government agencies as tabulated in Table 7-1, and as classified into economic sectors in Table 7-2.

2.1.2 The Local Government

The country is divided into more than twenty (20) departments, the largest administrative division in Guatemala, whose governors are appointed by the President, but the departments have no operational organization. The Governor (Gobernador) of each department acts as a link between the Office of President and the governments of municipalities which are the most-local government units. He also fills the role of chairman of the Departmental Emergency Committee, which is the execution arm of CONE/¹ in the department level. Serious disasters in the municipalities are relayed to the Office of the Presidency through the governors, and restoration works may be carried out by the Central Government.

The departments are further divided into more than three hundred (300) municipalities, where an operational organization is established under the Mayor (Alcalde) to provide residents with administrative services. The municipalities, under the jurisdiction of the Ministry of the Interior, are afforded a budgetary assistance through the National Institute of Municipal Development (INFOM), one of the decentralized agencies.

The operational organization of the Municipality of Escuintla is presented as an example in Fig. 7-2.

2.2 Agencies Concerned in Water Management

Water management in Guatemala, on the ministry's level, is undertaken by five (5) ministries; 1) Ministry of Communications, Transportation and Public Works, 2) Ministry of Agriculture, Livestock and Nutrition, 3) Ministry of National Defense, 4) Ministry of Public Health and Social Security, and 5) Ministry of the Interior. The departments and the municipal governments take part in management and sometimes, private sectors are involved.

Hereunder summarized are directions and corporations under the above-mentioned ministries and the other agencies in charge are summarized as follows:

¹ : National Emergency Committee

(1) Ministry of Communications, Transportation and Public Works

CAMINOS (General Direction of Roads)
DGOP (General Direction of Public Works)
INSIVUMEH (National Institute of Seismology,
Volcanology, Meteorology and Hydrology)
XAYA-PIXCAYA (National Project of XAYA-PIXCAYA)
INDE (National Institute of Electrification)
FEGUA (National Railway of Guatemala)

(2) Ministry of Agriculture, Livestock and Alimentation

DIGESA (General Direction of Agricultural Services)
INAFOR (National Forest Institute)

(3) Ministry of National Defense

IGM (Military Geographic Institute)
CONE (National Emergency Committee)

(5) Ministry of the Interior

INFOM (National Institute of Municipal Development)

(6) Others

EMPAGUA (Municipal Water Enterprise of the
Municipality of Guatemala)

The water management agencies and their organizational interrelation are shown in Fig. 7-3, and the major activities concerning water management of these agencies are summarized in Table 7-3. The above-mentioned agencies may be broadly classified in three categories; Flood Prevention, Water Supply, Research and Environmental Conservation.

2.2.1 Flood Prevention

CAMINOS, FEGUA, DIGESA, INDE and CONE are in charge of prevention, restoration and relief activities against damages caused by flood and sediment discharges. Among these five (5) agencies, CAMINOS, FEGUA and DIGESA carry out flood prevention works to protect only the facilities under their administration. Restoration works are undertaken by all the agencies themselves when their facilities are damaged except CONE which is responsible for warning and saving lives in case of emergencies such as flooding, volcanic eruption, earthquakes and epidemics.

A so-called inter-institution committee is organized under the chairmanship of the Vice-Minister of Defense in case of occurrence of disasters, to smoothly carry out rescue and restoration activities by assigning the activities to each agency and preparing their detailed programs.

2.2.2 Water Supply

Service water and sewage facilities are designed, constructed and maintained by so many agencies such as DGOP, INFOM, UNEPAR, DGSS, EMPAGUA, XAYA-PIXCAYA, municipal governments and others, which have a complicated relationship with one another, as tabulated below.

<u>Agency</u>	<u>Services</u>	<u>Objective Area</u>
DGOP	Design	All residential area
INFOM	Design and construction	Central area of Municipality (Cabecera Municipal)/ <u>1</u>
UNEPAR	Design and construction	Community with a population of over 500 approx.
DGSS	Design and construction	Community with a population of under 500 approx.
Municipality	Operation and construction	Central area of Municipality
EMPAGUA/ <u>2</u>	Construction, operation and maintenance	Municipality of Guatemala
XAYA-PIXCAYA	Design and construction	XAYA-PIXCAYA Project Area
Community	Operation and maintenance	Community
Developer	Design and construction	Specific area

DIGESA is in charge of research, planning, construction, operation and maintenance of irrigation and drainage projects in the whole country. In private farms (Finca), however, irrigation and drainage facilities are provided by owners at their own expense, and its area and water consumption volume are not identified.

INDE is only the agency that is promoting hydropower generation projects, and the scope of its services covers planning, construction, operation and maintenance, and management.

CAMINOS, besides the flood prevention works for roads, carries out dredging works for the conservation of navigation in Chiquimulilla Canal.

1 : Except for Guatemala and Mixco Municipalities

2 : Branched out from the government of Guatemala Municipality

The Department or Governor (Gobernador) is in charge of coordination among water undertakers and in the departments of Izabal and Solola where water navigation is extensively utilized, the governor also takes charge of the administration of navigation.

2.2.3 Research and Environmental Conservation

Observation on rainfall and river water level is conducted mainly by INSIVUMEH and INDE. INSIVUMEH collects data from 157 rainfall and 38 water level observation stations which were installed all over the country. INDE, in addition to the above, has 38 and 42 stations for rainfall and river water level observations, respectively, to collect the data required for the operation of hydropower generation dams.

INAFOR takes charge of the conservation and development of forests and environmental conservation. IGM performs mainly surveying and mapping services.

2.3 Outline of Each Agency

CAMINOS

CAMINOS was established in 1942 as one of the general directions under the Ministry of Communications, Transportation and Public Works. Its scope of services covers planning, design, construction, operation and maintenance of the road network in the country. As far as water management is concerned, this agency is in charge of flood prevention and restoration works for the roads and road bridges that are included in its regular operation and maintenance services. In addition, it is engaged in the dredging of Chiquimulilla Canal to assure the function of navigation.

The operational organization of CAMINOS is composed of four (4) divisions under General Direction and Sub-Direction, as shown in Fig. 7-4. Among the divisions the Maintenance Division together with its regional offices, is responsible for the services related to water management.

FEGUA

The original body of FEGUA was established in the 1880's and at present, it is one of the decentralized agencies under the Ministry of Communications, Transportation and Public Works. This agency is the government enterprise which is operating the railway transportation system which has a total operational length of 778.9 km. The main line runs from Puerto Barrios on the coast of Gulf of Honduras to Tecun Uman on the Mexico boundary. The services in connection with water management include flood prevention and restoration works for the railway and its bridges.

FEGUA has eight departments in its operational organization, and its Engineering Department is in charge, together with its

district supervision offices, of the above-mentioned services. The operational organization of FEGUA is shown in Fig. 7-5.

DIGESA

DIGESA is one of the general directions under the Ministry of Agriculture, Livestock and Nutrition. This direction administers agricultural water use and activities, and programs the use of agricultural facilities. The scope of services related to water management covers planning, design, construction, operation and maintenance of irrigation and drainage facilities. It also includes flood prevention and restoration works for the said facilities.

In the operational organization of DIGESA are five (5) directions, under which eight regional offices were organized as illustrated in Fig. 7-6. It is the Irrigation Direction (DIRYA), together with its regional offices, that is responsible for the services related to water management. The organization of DIRYA is shown in Fig. 7-7.

DIRYA takes charge of planning, design, construction and restoration of the irrigation facilities, while the regional offices are concerned in the operation and maintenance of these facilities, construction of irrigation facilities for small areas under 100 ha, and restoration works in cooperation with DIRYA.

INDE

INDE was established in 1959 as one of the decentralized agencies under the Ministry of Communication, Transportation and Public Works. This agency is in charge of electric power generation, and supplies all the hydroelectric power in the country. As of 1982, its generation capacity totaled 364.9 MW which accounts for about 80% of the national total capacity.

The services concerning water management include all the engineering aspects, together with the operation and maintenance of the hydropower generation facilities as well as flood prevention and restoration works for the related areas. Further, they include hydrological observations on rainfall and river water level which are necessary for hydropower generation.

The operational organization of INDE is composed of four (4) sub-management offices under the General Management, as illustrated in Fig. 7-8. The Planning and Project Sub-Management Office is responsible for the basic study and planning of power generation projects and hydrological observations, while the Works and Production Sub-Management Office is in charge of design, construction, operation and maintenance and restoration works for the related facilities.

CONE

CONE stands for the national emergency committee which was established in 1969 under the Ministry of National Defense.

The most important assignment of CONE is rescue operations for people suffering from disasters such as those enumerated hereunder:

- (a) Earthquakes;
- (b) Large-scale airplane accidents;
- (c) Danger of explosion due to a fire;
- (d) Forest fires;
- (e) Flood and inundation;
- (f) Volcanic eruption;
- (g) Traffic accidents with a lot of victims;
- (h) Effluence of poisonous gas;
- (i) Assault by nuclear weapons;
- (j) Massive intoxication;
- (k) Interruption of public service;
- (l) Epidemics and/or epizootics; and
- (m) Other natural and man-made disasters of all kinds.

The following services are actually rendered to cope with the above-mentioned disasters:

- (a) Investigation of dangerous areas;
- (b) Warning and direction of evacuation;
- (c) Direction of rescue activities and safeguard of the victims;
- (d) Identification of the victims; and
- (e) Preparation of the annual National Emergency Plan.

CONE directs and/or coordinates with other government agencies, local governments and other corporations in carrying out rescue activities, and arranges the activities between the fire brigades and other rescue parties.

The organization of CONE is presented in Fig. 7-9, in which the General Assembly which is headed by the Minister of Defense is positioned under the President of CONE who is directly responsible to the President of the Republic. The members of this assembly consist of the ministers of 1) Communications, Transportation and Public Works, 2) the Interior, 3) Public Health and Social Assistance, 4) Agriculture, Livestock and Nutrition, and 5) Economics, and of the directors of 1) Chamber of Commerce, 2) Chamber of Industry, 3) General Association of Agriculture, 4) National Association of Bankers, 5) Association of Journalists of Guatemala, and 6) Guatemalan Red Cross. Under the General Assembly are the Executive Committee, the department emergency committees, the municipal emergency committees, and the rural emergency committees. These committees are headed by the respective department governors (Gobernador), mayors (Alcalde) and vice-mayors (Vice-Alcalde), respectively. Each regional committee can, on its own judgement, issue warnings in cases of emergency.

DGOP

DGOP is one of the General Directions under the Ministry of Communications, Transportation and Public Works. It is in charge of planning, design and construction of infrastructures

such as schools, hospitals, service water facilities and sewage facilities. Its operational organization is illustrated in Fig. 7-10.

The services concerning service water and sewage are only design works covering all the residential areas in the country, but especially in most of the urbanized areas such as the central areas of Municipalities of Guatemala and Quetzaltenango. DGOP sometimes assists INFOM in designing service water and sewage facilities in case of a shortage of staff in INFOM.

INFOM

INFOM is one of the institutes in the decentralized organization. This agency was organized in 1965 under the Ministry of the Interior to afford the municipal governments with the technical and financial assistance regarding various kinds of public works and services. Its operational organization is shown in Fig. 7-11. The major services related to water management are design and construction of service water and sewage facilities in the central area of municipalities (Cabecera Municipal) except for the municipalities of Guatemala and Mixco where they themselves perform such services. After the facilities are completed, the respective municipalities are generally responsible for their operation, maintenance and management.

UNEPAR

UNEPAR was established in 1978 as one of the agencies under the Ministry of Public Health and Social Security. The operational organization is shown in Fig. 7-12. Its most important services are design and construction of service water facilities for small rural communities with a population of over approximately 500. Underground and spring water are used as water source instead of river water. The communities take over these facilities after completion, and render operation, maintenance and management services.

DGSS

DGSS is one of the General Directions under the Ministry of Public Health and Social Security. Among the divisions of DGSS shown in Fig. 7-13, the Division of Environmental Sanitation (DSM) is in charge of the activities concerning water management, i.e., improvement of rural sanitation. Its detailed services are design and construction of service water facilities in rural communities having a population of approximately under 500 and quality examination and control of water for home use, river water and lake water. DGSS uses underground and/or spring water as sources for service water, same as UNEPAR. Maintenance, operation and management after the completion of facilities are usually carried out by the communities themselves.

EMPAGUA

EMPAGUA was established in 1973 as an enterprise branched out from the government of Guatemala Municipality, whose Mayor (Alcalde) act as the director, in order to exclusively take charge of construction, operation, maintenance and management of the service water and sewage facilities in the Municipality of Guatemala, as opposed to the limitation of administrative boundaries, because the services are rendered on the urbanization zone basis. However, the area covered by the Xaya-Pixcaya Project, a water supply project, is excluded from the service area of EMPAGUA. The operational organization is illustrated in Fig. 7-14.

XAYA-PIXCAYA

XAYA-PIXCAYA is the executive agency for the XAYA-PIXCAYA Project, which is attached to the Ministry of Communications, Transportation and Public Works. The operational organization of XAYA-PIXCAYA is shown in Fig. 7-15. This agency is responsible for the design and construction of service water facilities which take in water from the Xaya and Pixcaya rivers. This agency will give way to EMPAGUA for the maintenance, operation and management after the completion of the project.

INSIVUMEH

INSIVUMEH was established in 1976 under the Ministry of Communications, Transportation and Public Works as one of the institutes in the decentralized organization. Its organization is shown in Fig. 7-16. This agency is in charge of observation and research on seismology, volcanology, meteorology and hydrology. As for the hydrological observation, INSIVUMEH collects rainfall and river water level data from the 157 and 38 stations spreading over the country, respectively.

INAFOR

INAFOR is included in the decentralized organization. It is attached to the Ministry of Agriculture, Livestock and Nutrition, and takes charge of investigation, development and conservation of environment; especially forests whereby water resources are assured in a hydrological cycle. As for the operational organization, Fig. 7-17 may be referred to.

IGM

IGM was originally organized under the Ministry of Communications, Transportation and Public Works as the National Geographic Institute (IGN), and currently belongs to the Ministry of National Defense. The organization is illustrated in Fig. 7-18. Its activities are mainly surveying and mapping, including geological survey topographic survey, geographical survey, geodetic survey and land use survey.

3. WATER MANAGEMENT LAWS IN GUATEMALA

3.1 Existing Laws on Water Management

Water management is being currently enforced in relevance to various existing laws concerning service water supply, sewerage, agriculture, hydropower generation, and so on as presented in Table 7-4. However, no specific law has yet been enacted for the prevention of floods and the management water of utilization on the river basin basis. It is a fact, therefore, that flood prevention works are individually provided and maintained by the related agencies themselves, and that the situation of water utilization in a river system cannot be identified.

Although the civil law of Guatemala grants private ownership of water resources in conjunction with development and use of any given land as long as such does not infringe upon public use of the same water, a specific law which states the water use and its allocation needs to be enacted so that public ownership of water can be firmly established. Accordingly, the draft of a new law meant to regulate water management has been under study since 20 years ago.

Though there is not concrete provision of law relating to flood control, the civil law concerning land use provides a landowner with the right to build flood control facilities on his own land.

3.2 Draft of "Ley de Aguas"

The Government has been endeavoring, in view of conservation of the natural resources and their proper development as well as of minimizing their loss through a lack of adequate management and control, to establish a law specifying institutions and their activities for such purposes. As to water resources, twenty (20) years have passed since the Government took initiative to establish laws and institutions concerning management of water resources so that water resources would be more rationally used and more smoothly developed. Thus, the Ministry of Communications, Transportation and Public Works organized the "Proyecto de Ley de Aguas" (Water Law Project) which has as its members INFOM, the Municipality of Guatemala, the Ministry of Agriculture, Livestock and Nutrition, the Ministry of Health and Social Assistance, University of San Carlos, and so on. As a result, the draft of an ordinance concerning water, which was prepared in reference to similar laws in other Latin American countries, was submitted to the Congress in 1982, but it failed to be enacted into law due to insufficient time for consideration.

The contents of this draft consist of the following aims in order to utilize water sources more rationally and comprehensively:

- (1) Planning on development, utilization and water demand and supply in the future concerning domestic water use, industrial water use, electric power use, and so on.

- (2) Conservation of river sources, preservation of recreational areas along rivers and riparian inhabitants, and prevention of water pollution in rivers.
- (3) Promotion of drainage works in inundation area and poorly drained area and irrigation works for farm development to increase agricultural production for national economic growth.
- (4) Establishment of legislative system to smoothly perform these works and activities in each stage of survey, study, planning, design and construction, and also, establishment of a new organization in charge of water management.

4. INTRODUCTION OF WATER MANAGEMENT SYSTEM AND RELEVANT LAWS IN FOREIGN COUNTRIES

4.1 Water Management System in Foreign Countries

Water is a commodity essential to life, community welfare and the functioning of the economy and is, therefore, of truly national importance, while it may cause a great deal of damage in the modes of flooding, tsunami and mud flow. Many nations have established an administrative system to realize the most effective water utilization and to facilitate the most appropriate water damage prevention, covering rivers, seacoasts, sediments, environments, and so on.

The system of water administration is considerably diversified from country to country or region to region according to the given conditions which determine the items and contents of water management. Various agencies are in charge of the water administration for water supply, water resources development, flood defense activities, and so on. Consequently, conflicts may sometimes take place between and among the agencies concerned when some interests are involved in more than two agencies on a project.

It has been regarded necessary to establish an administrative organization including an agency authorized to coordinate water planning and management activities taken by various agencies. Herein introduced are examples of water administration system of countries such as Japan, the United States of America and the United Kingdom, focusing on the coordination of water management and project execution.

4.1.1 Japan

Japan has a long history in water management. It has been reported that people initiated flood prevention works in the 4th century, and that large-scale river improvement works were carried out in the 19th century by the then government. The central government came to assume the responsibility for water management covering the whole country after the centralization of power in 1868.

As the national economy was rapidly developing, water problems occurred especially in water undertaking for agriculture and hydropower generation purposes, and accordingly, coordination of water utilization came to be regarded necessary. After World War II, the Government of Japan was newly organized and entitled to provide full coordination of water utilization based on the River Law which was enacted in 1896 and revised in 1964. The government is currently in charge of a multiplicity of water management fields such as flood prevention, water resources development, sediment flow control, seacoast preservation, and so on.

Administrative Organization

Water management in Japan is carried out on the cabinet level by the Ministry of Construction, which is the leading agency, followed by the Prime Minister's Office, the Ministry of Health and Welfare, the Ministry of Agriculture, Forestry and Fishery, the Ministry of International Trade and Industry, and the Ministry of Transport.

The above-mentioned ministries, except for the Ministry of Construction and the Ministry of Health and Welfare, have some subordinate agencies in charge of water management directly or indirectly according to the regional peculiarities and the contents of management, as shown in Fig. 7-19. The important assignments of these ministries are referred to in Table 7-5.

Coordinating Agency

The Ministry of Construction coordinates interministry activities and approves water utilization programs. In short, this ministry is fully held responsible in the coordination of water management in Japan. It is composed of the ministry proper, the auxiliary organs which are mainly making research and survey works, and the regional offices.

The ministry proper consists of the Minister's Secretariat and the five bureaus that include the River Bureau which specializes in water management, especially river administration in Japan. This bureau has one department, the Sabo Department, and eight divisions, namely; 1) General Affairs, 2) Water Administration, 3) River Planning, 4) River Improvement, 5) Urban Rivers, 6) Development, 7) Seacoast, and 8) Disaster Prevention. The Sabo Department has two divisions; Sabo Division and Slope Conservation Division. The organization chart of the Ministry of Construction is shown in Fig. 7-20, in which the River Bureau is broken down into many Divisions and Sections. Divisional function of the River Bureau is explained in Table 7-6.

The regional offices spreading all over the country are held responsible for day-to-day water administration through various works offices dealing with survey, planning, design and project implementation. Local governments also direct water administration for small local rivers under the direction of the Ministry of Construction, while the ministry administers the

large rivers which may exert a serious influence over a large area in the multiplex aspect.

Project Execution Agencies

At the ministry level, only the Ministry of Construction and the Ministry of Agriculture, Forestry and Fishery are concerned in project execution. The River Bureau in the Ministry of Construction is responsible for planning, execution, operation and maintenance of comprehensive river basin development projects covering all the large river systems in Japan. Its scope of services includes flood prevention, water resources development, seacoast preservation and environmental conservation. The Sabo Department was established in the River Bureau to carry out the planning and execution of erosion control and landslide prevention works for the large rivers.

The Agriculture Structure Improvement Bureau in the Ministry of Agriculture, Forest and Fishery takes charge of execution of national reclamation projects for agricultural development, as well as their disaster prevention and restoration works. The Forestry Agency, organized under this ministry, is responsible for the conservation of forests which provide storage of water resources thereby delaying flood runoff. In this connection, this agency is in charge of the execution of land-slide prevention works for the purpose of forest conservation.

The execution of other projects concerning water is done by the local governments and private companies. Hydropower generation projects, if the dam is constructed solely for power generation purposes, are promoted by private companies under the guidance, supervision and assistance of the Ministry of International Trade and Industry. Facilities for service water supply and sewage are provided by the prefectural and municipal governments under the guidance, supervision and assistance of the Ministry of Health and Welfare.

4.1.2 The United States of America

The United States does not have a long history of water management. Improvements to navigation were first attempted by the federal authorities in the late eighteenth and early nineteenth centuries. A decision was made in 1824 to the effect that the Federal Government has an interest and therefore an authority to administer and control rivers for navigational and commercial purposes. Although water management was to remain a primary responsibility of the states, it soon became apparent that conflicts of uses and subsequently conflicting management decisions concerning rivers shared by many states would have to be resolved. In addition, the management of rivers for purposes such as water supply, water quality, hydroelectric power generation, flood control, navigation, recreation, etc., was an extremely costly venture.

The Federal Government eventually assumed a leading role in the water management and water resources development. To carry out this task, agencies were created with specific river management

responsibilities. The responsibilities grew from single purpose to multiple purpose, as river management projects progressed from responding to one need to fulfilling multiple objectives in each project.

Administrative Organization

A network of agencies at the federal level have been organized for water administration under the jurisdiction of the Office of the President as shown in Fig. 7-21. The major agencies sharing responsibility for water administration are listed in Table 7-7, along with their functional jurisdictions and departmental affiliations. The most important of these agencies from the viewpoint of extent of authority and functional jurisdiction are the Water Resources Council, the Corps of Engineers, and the Bureau of Reclamation.

Coordinating Agencies

The Water Resources Planning Act of 1965 established the Water Resources Council as an independent executive agency of the U.S. Government to encourage the conservation, development, and utilization of water and related land resources of the United States on a comprehensive and coordinated basis.

The Water Resources Council has a full-time staff for carrying out its responsibilities, in addition to the members which compose the Council. The members are heads of the various Federal departments concerned in developing water and related land resources, namely; the secretaries of the Department of Agriculture, the Army, Commerce, Energy, the Interior, Housing and Urban Development, and Transportation and the Administrator of the Environmental Quality, the Chairman and Vice Chairman of the river basin commissions, and the Chairman of the Tennessee Valley Authority are observers.

The Water Resources Planning Act of 1965, in addition to creating the Water Resources Council, provided for the establishment of river basin commissions having the following functions:

- (1) To serve as the principal coordinating agency for plans for water and related land development.
- (2) To prepare and keep up-to-date a comprehensive coordinated joint Federal-State plan for water and related land resources development within the basin.
- (3) To recommend priorities for data collection and for investigations, planning, and construction of project.
- (4) To foster and undertake such studies as are necessary in preparing the comprehensive plan.
- (5) To submit to the Water Resources Council, with its comprehensive plan, recommendations for implementing the plan.

There are presently seven river basin commissions in the United States. The organization of the New England River Basin Commission is presented as an example in Fig. 7-22.

Project Execution Agencies

In the Federal agencies, the U.S. Army Corps of Engineers and the Bureau of Reclamation serve as project execution agencies on the river basin basis. The Tennessee Valley Authority (TVA) is another agency which has the power necessary to implement projects, but it operates exclusively in the Tennessee River Basin.

The Corps is responsible for portions of long range river basin planning for most large river systems in the United States, as opposed to the limited geographical scope afforded other agencies. The Corps' authority for resources developments flows from the Chief of Engineers to the Directorate of Civil Works, as shown in Fig. 7-23. As a basic policy, the Office of the Chief of Engineers (OCE) performs staff supervision. The civil works functions of the OCE are supervised by the Director of Civil Works, with support from other directorates and offices. Civil works functions include matters relating to the planning, design, construction, operation, and maintenance of river, harbor, and waterway improvements for flood control, navigation, multiple-use purpose, and shore protection projects or programs. The organization of the Directorate of Civil Works is illustrated in Fig. 7-24. The bulk of the work assigned to the Chief of Engineers and the Civil Works Directorate is carried out by the field offices of the Directorate.

The Bureau of Reclamation is organized as a part of the U.S. Department of the Interior. It was originally created by the Secretary of the Interior as the Reclamation Service, and was charged with carrying out the provisions of the Reclamation Act of 1902. This Act authorized the Department of the Interior to locate, construct, and maintain irrigation works with the proceeds of public land sales in western states. Although the Bureau's water resource planning responsibilities have since outgrown the narrow irrigation function it was originally granted, the Bureau's works are still restricted to the seventeen western states. The Bureau is now involved in planning, design, construction, and operation of water resources projects serving irrigation, municipal and industrial water supply, hydroelectric power generation, flood control and navigation, as well as recreation, and fish and wildlife enhancement purposes.

The Tennessee Valley Authority (TVA) was created as a regional resource development agency in 1933 and was initiated in response to the emerging concept of the unity of a river system and the interrelationship of its resources. The area of TVA's authority was defined by geography, and not by subject matter as was traditional in government organization. TVA has powers to acquire real estate necessary for projects and to construct dams, powerhouses, transmission lines, navigation facilities, etc., in the Tennessee River and its tributaries.

4.1.3 The United Kingdom

The United Kingdom consists of England and Wales, Scotland and North Ireland, which have their own water administration system, though somehow similar to each other. The water administration system in England and Wales is described hereunder as a representative example because it covers the largest area in the United Kingdom and has been recently renewed to perform a proper coordination among the agencies concerned.

In England and Wales, the Department of the Environment, the Ministry of Agriculture, Fisheries and Food, and the Welsh Office have the responsibility of determining through parliament national objectives in the water field and ensuring implementation of legislation.

The Secretary of State for the Environment has the duty to promote jointly a national policy for water in England and Wales to secure the effective execution.

Administrative Organization

In England and Wales, the majority of the executive responsibility in the water management field are laid down in the legislation of the Water Act of 1973, which has reorganized the water administrative organization and defined the roles of the different agencies by establishing rights, duties and powers for both customers of water and water services and the administrative agencies themselves. The reorganized water administrative structure is presented in Fig. 7-25, and the detailed functions of the agencies concerned are summarized in Table 7-8.

Coordinating and Project Execution Agencies

One organization assumes responsibilities for coordination among the agencies concerned in water management and also for execution of projects for river basin development on a comprehensive basis, which may be different from other foreign countries.

The Water Act of 1973 newly established ten water authorities, nine in England and one in Wales, to solve the problems and conflicts involved in water planning and management before then. The new authorities were created from the 29 pre-existing river authorities, created by the Water Resources Act of 1963, and from the 1,393 sewage treatment and sewerage departments of the local authorities in England and Wales together with 157 statutory water supply undertakings.

The geographical areas of the water authorities are not based on administrative units, but on groups of river basins so potentially minimizing problems arising from physical interdependencies within hydrological systems. The authorities are multi-functional in that they are responsible for all aspects of water planning and management, in contrast to previous

authorities which were responsible for only part of the hydrological cycle. These full responsibilities include the development of water resources and water distribution to domestic, commercial, industrial and agricultural premises. The authorities are also responsible for pollution prevention, and also sewerage and sewage treatment. Duties taken over directly from the river authorities include river management, flood protection, land drainage and sea defences.

The water authorities are also responsible for promoting fisheries on inland water and estuaries. In addition, every authority may take steps to secure the use of water and land associated with water for the purpose of recreation and it is their duty to develop water and associated land resources for the best recreational use.

The membership of water authorities combines local representation and government appointees. A majority of each Authority comprises local representatives appointed from their councilors by County and District Councils in the area concerned, but the chairman is appointed by the Secretary of State for the Environment. The authorities established several committees such as the Policy and Resources Committee, Regional Land Drainage Committee, Water Amenity Recreation and Fisheries Committee, Water Management Committee, and so on.

The internal organization of the water authorities involves two tiers. First, regional headquarters' staff are organized around a corporate management team including the directors of Resources Planning, Operations, Finance, Scientific Services and Administration, so that regional water planning problems can be viewed in totality, reflecting the interdependencies inherent in the hydrological cycle. Over these directors sits a Chief Executive directly responsible for personnel and public relations. The second tier within the water authorities is at divisional level. The working party on reorganization advocate further multifunctionalism at this level, so that divisions would assume all responsibilities for water throughout their areas.

The committee structure and operational structure of the Severn Trent Water Authority, for example, are presented in Fig. 7-26.

4.2 Laws Related to Water Management in Foreign Countries

In almost every country are currently being enforced many laws and acts in connection with various water management fields such as flood prevention, sediment flow regulation, water utilization, environmental pollution, and so on. The related legislations of Japan, the United States of America and the United Kingdom are introduced hereunder.

4.2.1 Japan

Laws related to water management in Japan can be broadly classified from their purposes into three major groups of flood

prevention, water resources development and environmental conservation. The major laws related to water management are summarized in Table 7-9.

Flood Prevention

The River Law was enacted in 1896 and revised in 1964 in order to administer comprehensively all the rivers in Japan, so that occurrence of disasters due to floods and high tides may be prevented and that proper utilization and normal functions of river water may be assured, whereby public safety is conserved and public welfare is promoted through their contribution to conservation and development of the nation. This law classifies the rivers into three classes together with their specific management systems so as to facilitate a successful river administration. This law further stipulates the regulation concerning construction of riparian works, countermeasures in case of emergency, usage of rivers, coordination of water use interests, construction of dams, and so on.

The River Law is the basic law for river administration in Japan, and necessary Acts and Regulations have been established thereby according to the administrative nature of the water management from time to time. Among the Acts established on the basis of the River Law, the Flood Defense Act and the Sabo Act which are considered important and especially related to this project are briefly explained as follows.

The Flood Defense Act was enacted in 1948 and stipulates the flood fighting system, the flood forecasting and warning system, the dispatch of flood fighting troops and the financial aspects of such activities. The Sabo Act, enacted in 1897, stipulates erosion and sediment control works in the upstream regions, the method of allocating project cost and restrictions on activities within designated areas.

As for the areas which are not covered by the River Law, there are three acts in force concerning water management. These are the Seacoast Act of 1956, the Landslide Prevention Act of 1958 and the 1969 Act on Disaster Prevention Due to Collapse of Steep Slope Land. The first was prepared to protect the coast and its hinterland from the damage due to tidal waves, high tides, etc. The second stipulates mainly the implementation procedure of counter-landslide works in order to obviate damage caused by landslide and coal-sludge collapse, while the third designates the steep slope land and stipulates the matters necessary to protect lives from disaster due to the collapse of steep slopes.

Water Resources Development

The first law concerning the water resources development by dam is the Specified Multipurpose Dam Act enacted in 1957. This Act stipulates special cases of the River Law in connection with the construction and control of multipurpose dams, and also clarifies the rights to use the developed water whereby

the function of multipurpose dam may be smoothly and duly fulfilled.

Environmental Conservation

The Basic Act for Environmental Pollution Control was enforced to comprehensively control public nuisance such as pollution, noise, etc. Effluent disposal and prevention are stipulated in the Water Pollution Control Act of 1970. The disposal of sewage is based upon the Sewerage Act which was enacted in 1958 in order not to deteriorate the water quality in public water areas.

4.2.2 The United States of America

In the United States of America, laws related to flood prevention, water resources development, and environmental conservation have been enacted as required by the needs of the time. The related laws are listed in Table 7-10.

Flood Prevention

The first law enacted by the Federal Government is the River and Harbor Act of 1899 when a low water channel of the Missouri River was constructed by the Army Corps of Engineers (COE). COE has assumed since then the responsibility of implementing navigation projects for the the whole country; mainly, the district between the Mississippi and the south-west coast.

In 1916, the Mississippi inflicted a great deal of flood damage on the neighboring areas. Considering the big flood as a precept, the Federal Government enacted the Flood Control Act in 1917 which was slightly amended in 1923 and drastically revised in 1928 after the area experienced extensive flood damages by the Mississippi. This Act was further revised in 1936, 1955, 1960 and 1972, and the Federal Government's functions and responsibilities concerning flood defense activities have been expanded through these revisions. The Watershed Protection and Flood Prevention Act was ratified in 1954 for the effective flood prevention in small-sized river basins.

The Soil Conservation Act was enacted in 1936 for the prevention of soil erosion and river bank scouring which may bring about aggravation or loss of agricultural lands. This Act established the Soil Conservation Service (SCS) under the jurisdiction of the Department of Agriculture.

The National Flood Insurance Act of 1968 set up a program whereby the economic losses attributed to floods could be spread over a larger population base. The Disaster Relief Act of 1972 and the Flood Disaster Protection Act of 1973 extended protection to people suffering from flood disasters.

Water Resources Development

The Bureau of Reclamation (BOR) was authorized by the Reclamation Act of 1902 and the Reclamation Project Act of 1939

to implement mainly water resources development projects in the western thirteen states.

In the state of Tennessee, the Tennessee Valley Authority (TVA) was organized under the Tennessee Valley Authority Act of 1933 which authorized the TVA to manage river basin development projects exclusively in the Tennessee Valley, same as the Army Corps of Engineers, the Bureau of Reclamation and the Soil Conservation Service do in other river basins.

In 1965, the Water Resources Planning Act was ratified to make it obligatory that an integrated study and planning shall precede basin-wise implementation of multifarious riparian works including river water control on a comprehensive and coordinated basis. The preamble of this Act is quoted hereunder:

"In order to meet the rapidly expanding demands for water throughout the Nation, it is hereby declared to be the policy of the Congress to encourage the conservation, development, and utilization of water and related land resources of the United States on a comprehensive and coordinated basis by the Federal Government, States, localities, and private enterprises with the cooperation of all affected Federal agencies, States, local governments, individuals, corporations, business enterprises, and others concerned."

This Act established the Water Resources Council (WRC), providing for the establishment of river basin commissions, and authorized the WRC to make grants available to the States for water and related land resource planning at the State level.

The Water Resources Development Act of 1974 was established through the recognition that water resources development, especially in the western part of the nation, be reconsidered to maximize the utilization of the limited water resources.

Environmental Conservation

The National Environmental Policy Act was enacted in 1972 to cope with environmental pollution due to development programs, and therefore requires that the environmental consequences of major Federal actions be considered in the planning process. The management for conservation of water quality or prevention of its deterioration is based upon the Federal Water Pollution Act and the Clean Water Act.

4.2.3 The United Kingdom

This sub-section deals with the laws related to water management in only the district of England and Wales, though there are three districts in the United Kingdom, to keep a conformity with the contents of the aforementioned water management system.

The water management in England and Wales has a long legal history as shown in Table 7-11. The related Acts can be

broadly classified into three main strands of water management; land drainage and flood prevention, water supply, and prevention of pollution.

Land Drainage and Flood Prevention

The Land Drainage Act of 1930 established the catchment boards, each covering a major river basin or group of smaller rivers, and endowed with general powers for land drainage in the catchment and special powers for flood prevention on certain defined main rivers.

After 1948 when the River Board Act was enacted, the Catchment Board gave way to river boards which had additional responsibilities for fisheries, pollution prevention and river gauging and now covered the whole country.

The river authorities replaced the river board after the Water Resources Act of 1973, which expanded the water agencies' responsibilities to cover flood forecasting, based on the hydrometric networks installed or improved by the river authorities.

The Water Act of 1973 established the water authorities in place of the river authorities to conduct the water management on a comprehensive and coordinated basis as aforementioned. This Act left the arrangement for land drainage and flood prevention virtually unaltered, though revolutionary in respect of water supply and effluent disposal.

Water Supply

The governmental concern for water supply began with the domestic supply and was limited to this. The growing urban populations of the early nineteenth century were supplied with water by new organizations, private companies or local Acts, but at first there was little uniformity in the operating rules.

The Waterworks Clauses Act of 1947 and of 1863 gave models for them to incorporate in their own legislations. The Public Health Act enacted in 1875 and in 1936 set out the basic code for domestic water supply.

The Water Act of 1945 greatly increased the central government's involvement with water supply problems and supervision of the water undertakers, and marks the beginning of a national water supply policy. The Act also broadened the basis of the water supply function, requiring water undertakers to supply water for non-domestic as well as domestic purposes. Another feature was the control of new groundwater abstractions in designated conservation areas. This was the beginning of abstraction licensing.

The Water Resources Act of 1963 provided a means of allocating water among potential users. The river authorities established

by this Act are entitled to afford licenses for water abstraction to the water undertakers, and also to have overall control of the development of new source works.

Nevertheless, most existing source works remained the property of the water undertakers, which resulted in inflexibility in the use of reservoirs and supply lines. The Water Act of 1973 tackled the problem by ending the independent life of the statutory water undertakers, and established the water authorities which took over the functions and assets of all local authority water undertakings.

Prevention of Pollution

The River Pollution Prevention Act of 1876 was the basic water pollution law for three quarters of a century, but it suffered from two factors militating against strong control of pollution; the safeguards and reservation it contained to protect industrial interests, and the multiplicity of authorities charged with its administration.

The Water Pollution Law was itself completely overhauled in 1951. The 1951 River (Prevention of Pollution) Act stipulated standards for quality and quantity, and entitled the River Boards to control new discharges by a quite different system of discharge licensing, while the 1875 Act was prohibitive; no polluting substances, whether sewage, manufacturing effluent or mine water, were to be discharged.

The system of discharge licensing has since been extended, by the Rivers (Prevention of Pollution) Act of 1961 and the Control of Pollution Act of 1974, to cover all discharges, new and old, to both non-tidal rivers and estuaries, and today the consent conditions imposed on the discharger are the principal weapons against water pollution.

The Water Act of 1973 took away the responsibility for sewage treatment and disposal from the local authorities, and placed it with the new water authorities in order to enlarge the financial basis for sewage disposal and to aid regional rationalization of treatment works. Sewage disposal was recognized by this Act as a part of the total hydrologic system, or as a major recycling element in water management.

TABLES AND FIGURES

Table 7-1 BUDGET OF GOVERNMENTAL AGENCIES IN GUATEMALA

Unit: x10³ Quezales

Governmental Agencies	1 9 8 1		1 9 8 2		1 9 8 3	
	Budget	%	Budget	%	Budget	%
Judicial	8,246	0.6	8,291	0.6	8,291	0.6
Office of the President	155,148	10.6	131,919	8.8	82,789	7.1
Foreign Affairs	9,820	0.7	10,518	0.7	10,312	0.7
Interior	42,998	2.9	47,058	3.2	49,261	3.7
National Defense	78,981	5.4	86,727	5.9	142,524	0.8
Public Finance	393,101	26.7	403,612	27.2	362,411	27.6
Education	156,213	10.7	156,735	10.6	162,884	12.4
Public Health and Social Assistance	120,784	8.2	139,450	9.4	101,037	7.7
Labor and Social Security	4,457	0.3	3,373	0.2	3,301	0.3
Economics	9,301	0.6	11,676	0.8	5,205	0.4
Agriculture	71,896	4.9	72,031	4.9	77,305	5.9
Communication and Public Works	409,853	28.0	405,026	27.3	294,334	22.4
Public	1,136	0.1	1,303	0.1	944	0.1
Accounting Office	3,765	0.3	3,712	0.3	3,655	0.3
T o t a l	1,465,699	100	1,481,431	100	1,304,253	100

Note: The Ministry of Energy and Mines was established in 1983, and its budget was included in that for the Office of the President.

Source: Presupuesto de Ingresos y Egresos del Estado. Dec. 1982, Fiscal 1983, Ministerio de Finanzas Publicas

Table 7-2 DISTRIBUTION OF BUDGET BY SECTOR IN GUATEMALA

Fiscal Year: 1983
Unit: x10³ Quetzals

S e c t o r	Budget	%
General Administration and Services	57,452	4.4
Defense and Internal Security	128,590	9.8
Finance	259,216	19.7
Urban Housing Development	14,493	1.1
Mineral and Hydrocarbon	5,010	0.4
Agriculture	68,138	5.2
Industry and Commercial	11,083	0.8
Tourism	2,651	0.2
Transportation	141,468	10.8
Communication	8,623	0.7
Energy	132,042	10.0
Health and Social Assistance	105,084	8.0
Labor and Social Security	220,893	16.8
Science and Cultural Education	159,510	12.1
T o t a l	1,314,253	100.0

Source : Presupuesto de Ingresos y Egresos del Estado. Dec. 1982
Fiscal 1983, Ministerio de Finanzas Publicas

Table 7-3 (1/3) ACTIVITIES OF WATER MANAGEMENT AGENCIES IN GUATEMALA

Ministry	Agency	Activities for Water Management
Communication, Transportation and Public Works	General Direction of Roads (CAMINOS)	- Flood prevention and restoration works of roads and road bridges
		- Dredging of Chiquimulilla Canal maintain normal navigation
		- Surveying works of the river channel in the vicinity of road bridges
	General Direction of Public Works (DGOP)	- Planning and design of water supply system for urban areas - Planning and design of sewage system for urban areas
	National Institute of Seismology, Volcanology, Meteorology and Hydrology (INSIVUMEH)	- Hydrological study - Observation of rainfall and water stage - Operation and maintenance of its facilities
	National Project of XAYA-PIXCAYA (XAYA-PIXCAYA)	- Design and construction of service water supply system for the Municipality of Guatemala which takes in water from Xaya and Pixcaya rivers
	National Institute of Electricity (INDE)	- Design, construction, operation maintenance and management of hydro-power generation facilities - Observation of rainfall and water stage related to hydro-power generation

Table 7-3 (2/3) ACTIVITIES OF WATER MANAGEMENT AGENCIES IN GUATEMALA

Ministry	Agency	Activities for Water Management
Communication, Transportation and Public Works	National Railway of Guatemala (FEGUA)	- Flood prevention and restoration works for railway and its bridges
		- Surveying works of the river channel in the vicinity of railway bridges
		- Observation of rainfall related to railway operation
Agriculture, Livestock and Nutrition	General Direction of Agricultural Services (DIGESA)	- Design, construction, operation and maintenance of irrigation and drainage facilities
		- Flood prevention and restoration works of these facilities
	National Institute of Forest (INAFOR)	- Conservation and fostering of national forest in the river basin
		- Environmental conservation and maintenance of ecological balance in the river basin
National Defense	Military Geographic Institute (IGM)	- Topographical survey and mapping
		- Geological survey
		- Land use survey
	National Emergency Committee (CONE)	- Research on areas vulnerable to disasters
		- Warning against disasters and direction of evacuation
		- Rescue activities for victims

Table 7-3 (3/3) ACTIVITIES OF WATER MANAGEMENT AGENCIES IN GUATEMALA

Ministry	Agency	Activities for Water Management
Public Health and Social Assistance	Executor Unit of Rural Aqueduct Program (UNEPAR)	- Design and construction of the supply facilities for villages with a population of about 500 or more
	General Direction of Health Services (DGSS)	- Design and construction of water supply facilities for communities with a population of about 500 or less - Analysis and conservation of quality of service water, river and lake water
Interior	National Institute of Municipal Development (INFOM)	- Design and construction of water supply facilities and sewage facilities in the central areas of Municipalities (except Guatemala and Mixco)
(Guatemala Municipality)	Municipal Water Enterprise (EMPAGUA)	- Construction of water supply and sewage facilities designated by DGOP in Guatemala Municipality (except the XAYA-PIXCAYA project area) - Operation and maintenance for all the water supply and sewage facilities constructed in Guatemala Municipality - Observation of water levels

Table 7-4 PRINCIPAL LAWS CONCERNING WATER MANAGEMENT IN GUATEMALA

Name of the Law	Year of Enactment
Regulation for Registry, Matriculation and Inscription of Vessels, Ships and Craft	1932
Organic Law of INFOM	1957
Municipal Code	1957
Law on Foundation of INDE	1959
Law of Agrarian Transformation	1962
Civil Code	1963
Regulation for the Rural Operation System of Domestic Water	1967
General Regulations of CONE	1969
Water Conduction Act	1972
Regulation of Irrigation	1972
National Harbor Commission	1972
Organic Law of INAFOR	1974
Forestry Law	1974
Regulation of INSIVUMEH	1974
Code of Health	1979
Regulation of the Ministry of Agriculture Livestock and Nutrition	1982

Table 7-5 (1/2) CONTENTS OF WATER MANAGEMENT BY MINISTRIES IN JAPAN

Ministry	Functions and Responsibilities
MINISTRY OF CONSTRUCTION	<ul style="list-style-type: none"> - Formulation of Riparian Projects - Water control activities including flood control, riparian restoration works, etc. - Adjustment and approval of water utilization programs - Formulation and implementation of water resources development - Observation of water-level, discharge and precipitation - Conservation of water quality - Prevention of damages due to debris and sharply sloped terrain
PRIME MINISTER'S OFFICE	<ul style="list-style-type: none"> - Investigation and formulation of development plans in Hokkaido and Okinawa
Subordinate Agencies: - Hokkaido Development Agency - Environmental Agency - Okinawa Development Agency - National Land Agency	<ul style="list-style-type: none"> - Formulation of policies and long-term plans for water resources development as well as disaster prevention - Conservation of water quality and wild life - Ecological preservation
MINISTRY OF HEALTH AND WELFARE	<ul style="list-style-type: none"> - Assurance of purity of water supplied through water works - Conservation of water quality

Table 7-5 (2/2) CONTENTS OF WATER MANAGEMENT BY MINISTRIES IN JAPAN

Ministry	Functions and Responsibilities
MINISTRY OF AGRICULTURE, FORESTRY AND FISHERY	- Development and use of irrigation water
Subordinate Agencies: - Food Agency - Forestry Agency - Fishery Agency	- Flood control in minor river basins - Development of fisheries
MINISTRY OF INTERNATIONAL TRADE AND INDUSTRY	- Hydro-electric power
Subordinate Agency: - Agency of Natural Reserches and Energy	- Assurance of industrial water - Regulation of drainage water (water quality conservation)
MINISTRY OF TRANSPORT	- Observation of rainfall and weather forecasting
Subordinate Agency: - Meterological Agency	- Announcement of flood warnings

Table 7-6 (1/2) CONTENTS OF RIVER ADMINISTRATION BY DIFFERENT DIVISIONS OF THE RIVER BUREAU OF THE MINISTRY OF CONSTRUCTION

Division	Functions and Responsibilities
General Affairs	- Coordination within the River Bureau
Water Administration	<ul style="list-style-type: none"> - Drafting of laws and ordinances in connection with river administration - Issurance of water use permits - Administrative supervision of river and seacoasts
Planning	<ul style="list-style-type: none"> - Comprehensive planning for river and seacoast projects - Coordination of water resources development projects - Water quality and environmental problems - International affairs
River Improvement	- Investigation into planning, implementation of construction and maintenance as well as management of river channels
Urban Rivers	- Investigation into planning and implementation of construction as well as management of urban rivers
Development	<ul style="list-style-type: none"> - Investigation into planning, construction and management of multipurpose dams - Enforcement of the Water Resources Development Public Corporation Act - Technical judgements regarding permission of water usage - Structural regulations for dams - Water resources development and natural environmental conservation

Table 7-6 (1/2) CONTENTS OF RIVER ADMINISTRATION BY DIFFERENT DIVISIONS OF THE RIVER BUREAU OF THE MINISTRY OF CONSTRUCTION

Division	Functions and Responsibilities
Seacoast	<ul style="list-style-type: none"> - Investigation into planning and execution of coastal conservation projects - Improvement and maintenance of seacoast
Disaster Prevention	<ul style="list-style-type: none"> - Estimation of expenditure on natural disaster rehabilitation projects for public utility facilities - Natural disaster prevention planning, natural disaster precautions, natural disaster emergency countermeasures and natural disaster rehabilitation
Sabo	<ul style="list-style-type: none"> - Coordination in the Sabo Department - Investigation into planning and implementation as well as direction and supervision of the Sabo works - Maintenance and management of Sabo facilities
Slope Conservation	<ul style="list-style-type: none"> - Investigation into planning and implementation for landslide prevention works, coal slagheap collapse prevention works - Maintenance of facilities mentioned above

Table 7-7 (1/2) MAJOR FEDERAL AGENCIES AND THEIR RESPONSIBILITIES
FOR WATER MANAGEMENT IN THE UNITED STATES OF AMERICA

Agency	Major Responsibilities
U.S. Water Resources Council	<ul style="list-style-type: none"> - Coordination/administration river planning - Grants to states for planning - Coordination river basin commissions
U.S. Department of Defense	
Corps of Engineers	<ul style="list-style-type: none"> - Navigation - Hydroelectric power generation - Municipal/industrial water supply - Water quality - Recreation
U.S. Department of the Interior	
Bureau of Reclamation	<ul style="list-style-type: none"> - Hydroelectric power generation - Municipal and industrial water supply - Irrigation - Floodplain management/navigation - Water quality - Recreation
Geological Survey	<ul style="list-style-type: none"> - Floodplain management - Water quality and quantity records
Heritage, Conservation and Recreation Service	<ul style="list-style-type: none"> - Preservation of cultural and historical values
Fish and Wildlife Service	<ul style="list-style-type: none"> - Fish and wildlife habitant values

Table 7-7 (2/2) MAJOR FEDERAL AGENCIES AND THEIR RESPONSIBILITIES
FOR WATER MANAGEMENT IN THE UNITED STATES OF AMERICA

Agency	Major Responsibilities
U.S. Water Resources Council	- Coordination/administration river
U.S. Department of Agriculture	
Soil Conservation Service	<ul style="list-style-type: none"> - Floodplain management - Irrigation - Water quality - Recreation
U.S. Department of Energy	- Hydroelectric power generation
U.S. Department Protection Agency	<ul style="list-style-type: none"> - Water quality - Floodplain management - Financing/budgeting (grants)
Tennessee Valley Authority	<ul style="list-style-type: none"> - Navigation - Hydroelectric power generation - Municipal and industrial water supply - Floodplain management - Water quality - Recreation

Table 7-8 (1/2) CONTENTS OF WATER MANAGEMENT BY AGENCIES
IN THE UNITED KINGDOM

Agency	Functions and Responsibilities
Department of the Environment Water Authority	<ul style="list-style-type: none"> - Overall responsibility of water administration in England and Wales - Water administration in connection with land use plan; improvement of urban environments; conservation of non-urban areas; recreational use of waters; water pollution control; urban housing plan; construction of new towns - City water-works - Conservation of water sources - River-water pollution control - Recreational use of waters
Ministry of Agriculture, Fisheries and Food Water Authority	<ul style="list-style-type: none"> - Fisheries promotion and control - Inland water elimination - Drainage works from inland and coastal areas and responsibility on water related to fisheries in England and Wales
National Water Council	<ul style="list-style-type: none"> - Negotiation on working conditions of fishery workers - Labor information services on behalf of water agencies and waterworks companies - Education and training of the fishery workers - Technical assistance to water agencies - Inspection and test of waterworks fittings

Table 7-8 (2/2) CONTENTS OF WATER MANAGEMENT BY AGENCIES
IN THE UNITED KINGDOM

Agency	Functions and Responsibilities
Water Space Amenity Commission	<ul style="list-style-type: none"> - Maintenance of water space amenities and agreeable environments in England - Combination of national water space and recreational activities
Water Data Unit	<ul style="list-style-type: none"> - Information-exchange among various water agencies and the Central Government
Water Research Center	<ul style="list-style-type: none"> - Research on water pollution along rivers, on the seacoast and estuaries - Research on sewerage water disposal and waste disposal - Studies on water resources, city water treatment, city water and sewerage conveyance, and health-related water quality problems - Technical assistance on the field

Table 7-9 MAJOR ACTS RELATED TO WATER MANAGEMENT IN JAPAN

Name of the Law	Year of Enactment/Revision
River Law	1894, 1964
Sabo Act	1897
Flood Fighting Association Act	1908
Act on Reclamation of Public Water Surface Area	1921
Flood Fighting Act	1948
Act on Financial Aid for Relief Projects of Public Utilities	1951
Seacoast Act	1956
Specified Multipurpose Dam Act	1957
Sewerage Act	1958
Landslide Prevention Act	1958
Basic Act on Counter Measures Against Natural Disasters	1961
Act on Anti-erosion and Anti-flood Special Measures	1960
Flood Control Special Accounting Act	1960
Water Resources Development Promotion Act	1961
Water Resources Development Public Corporation Act	1961
Act on Financial Aid for Relief from Severe Natural Disasters	1961
Act on Disasters Prevention due to Collapse of Steep Slope Land	1969
Basic Act for Environment Pollution Control	1970
Water Pollution Control Act	1970
Act on Special Measures for the Reservoir Area Development	1973

Table 7-10 MAJOR ACTS RELATED TO WATER MANAGEMENT
IN THE UNITED STATES OF AMERICA

Name of the Law	Year of Enactment/Revision
River and Harbor Act	1899
Reclamation Act	1902
Flood Control At	1917, 1928, 1936, 1955, 1960
Tennessee Valley Authority Act	1933
Soil Conservation Act	1936
Reclamation Project Act	1939
Watershed Protection and Flood Prevention Act	1954
Water Resources Planning Act	1965
National Flood Insurance Act	1968
National Environmental Policy Act	1970
Federal Water Pollution Control Act	1972
Disaster Relief Act	1972
Flood Disaster Prevention Act	1973
Water Resources Development Act	1974
Clean Water Act	1977

Table 7-11 MAJOR ACTS RELATED TO WATER MANAGEMENT
IN THE UNITED KINGDOM

Name of the Law	Year of Enactment/Revision
Water Works Clauses Act	1847, 1863
Public Health Act	1875, 1936
Water Act	1945, 1973
River Pollution Prevention Act	1876, 1951
Land Drainage Act	1930, 1961
River Board Act	1963
Control of Pollution Act	1974

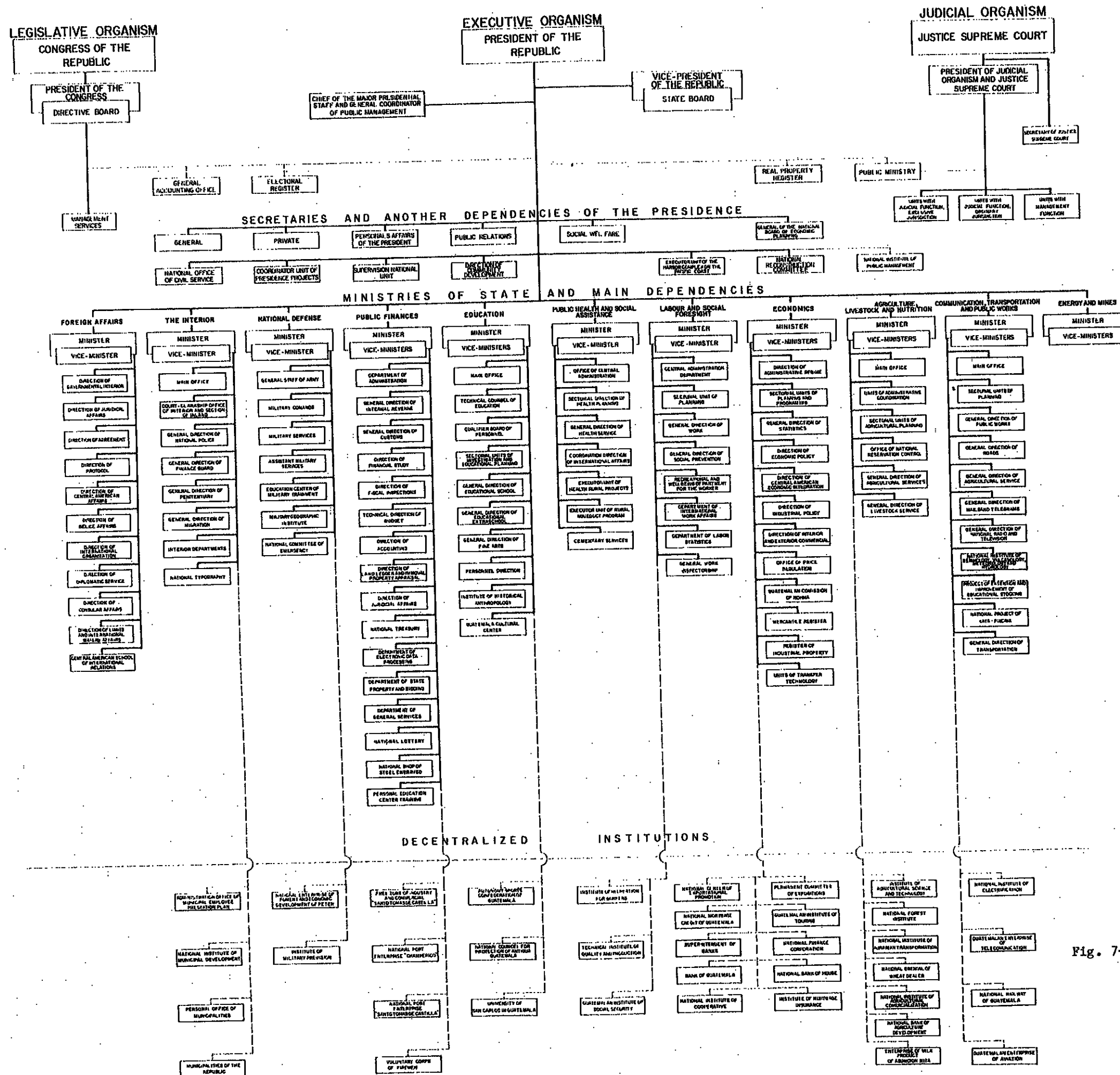


Fig. 7-1 MANAGEMENT ORGANIZATION OF THE GOVERNMENT OF GUATEMALA

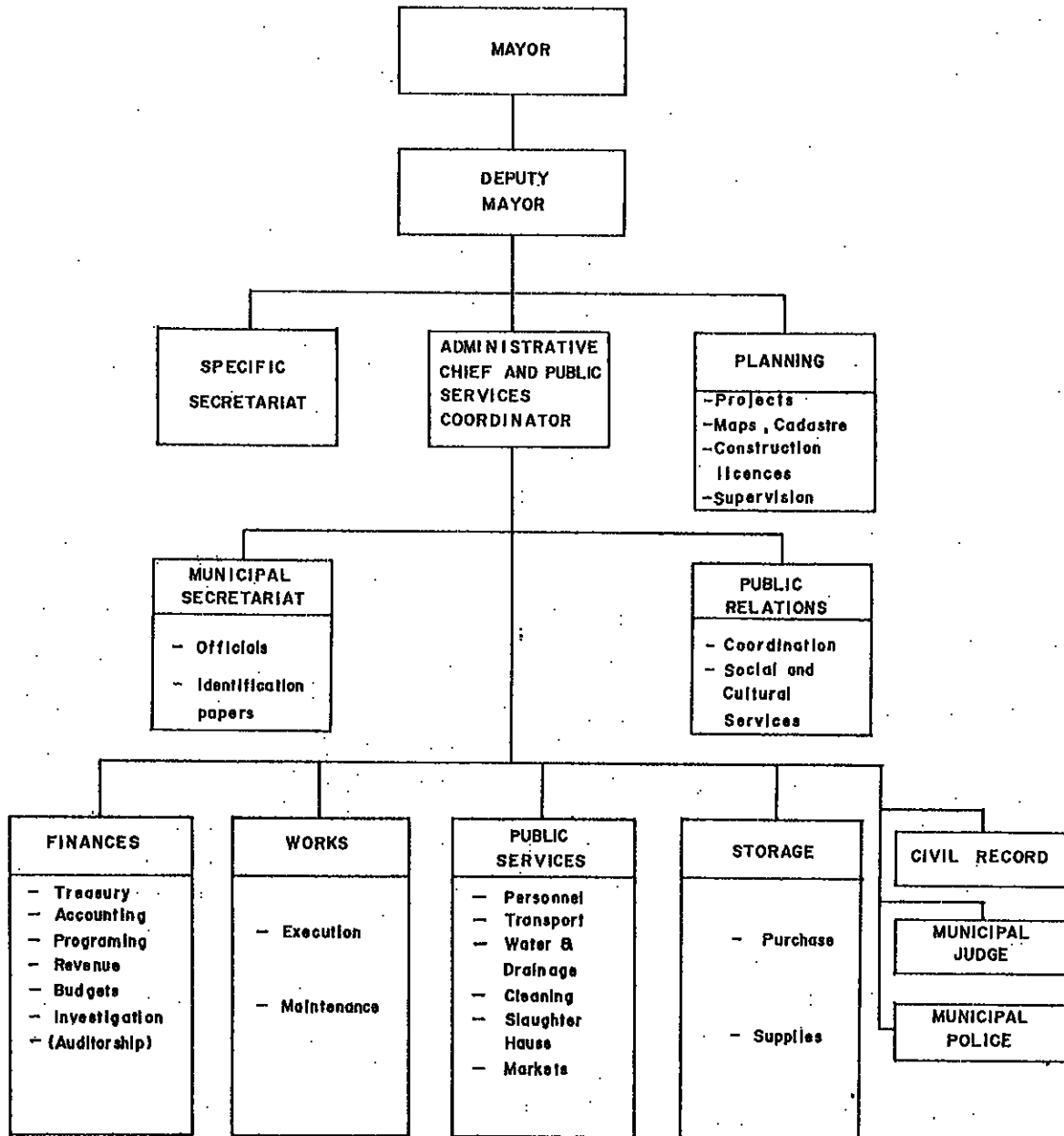


Fig. 7-2 ORGANIZATION CHART OF THE MUNICIPAL GOVERNMENT OF ESCUINTLA

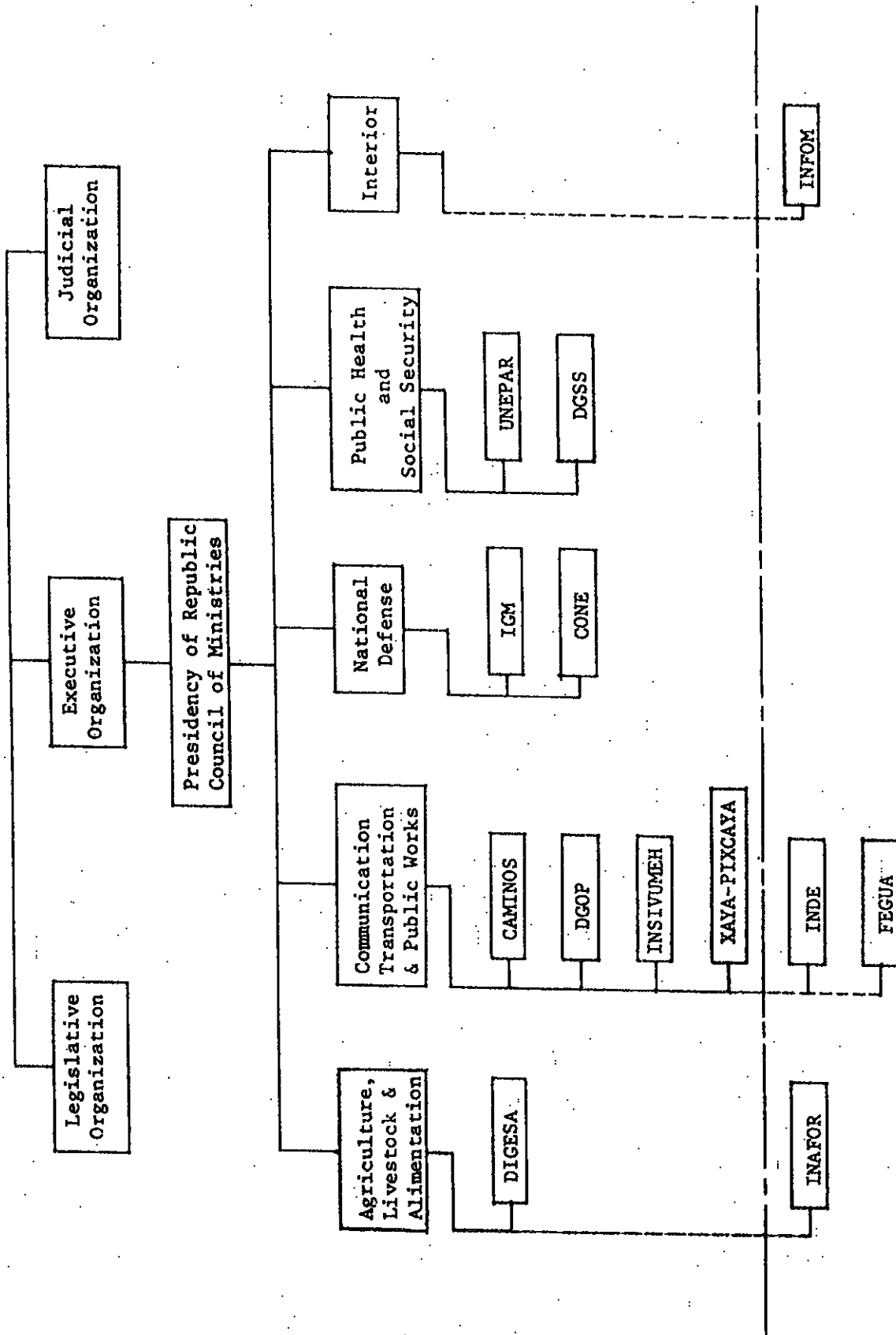


Fig. 7-3 WATER MANAGEMENT AGENCIES IN GUATEMALA AND THEIR INTERRELATION

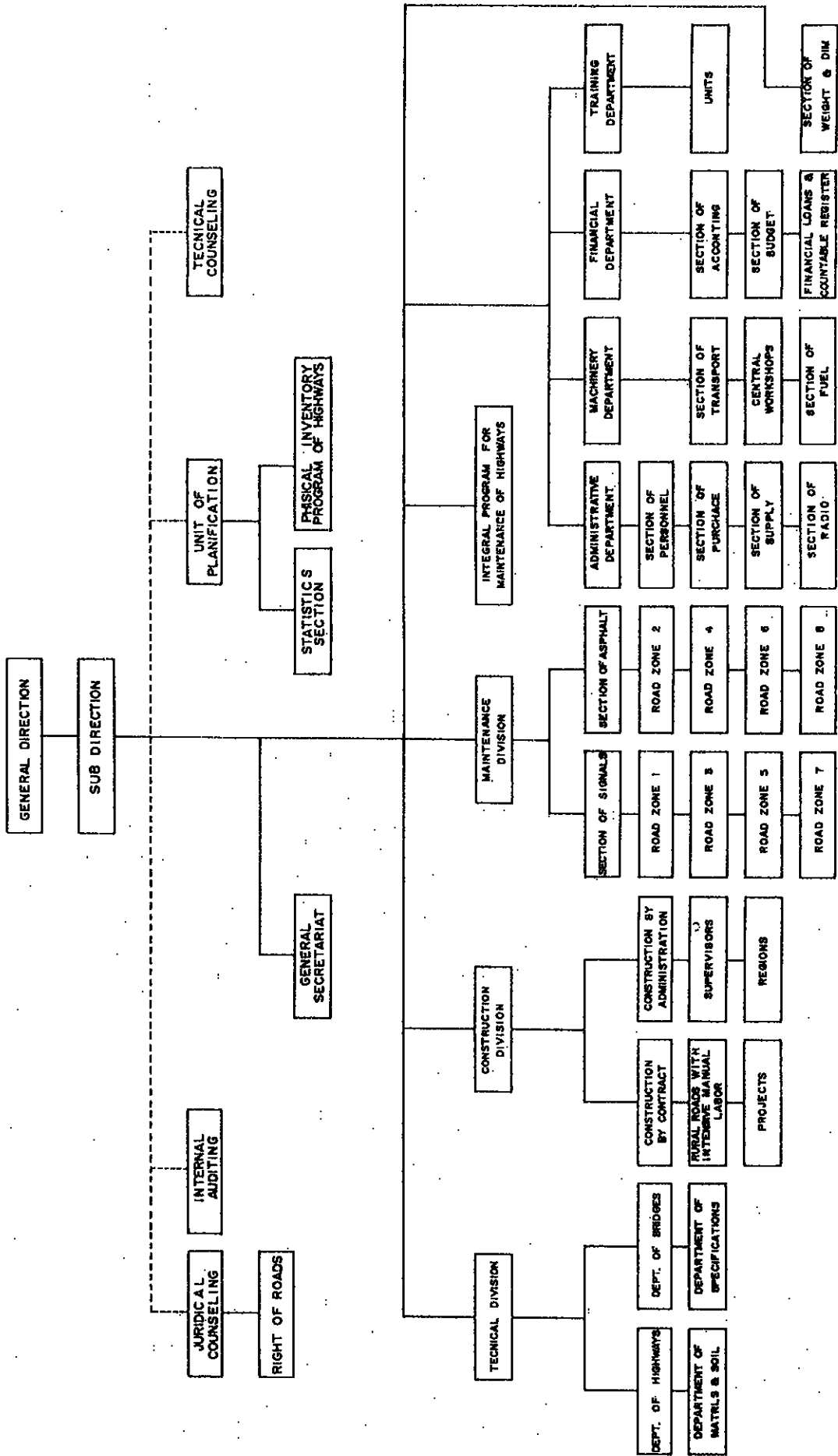


Fig. 7-4 ORGANIZATION CHART OF CAMINOS

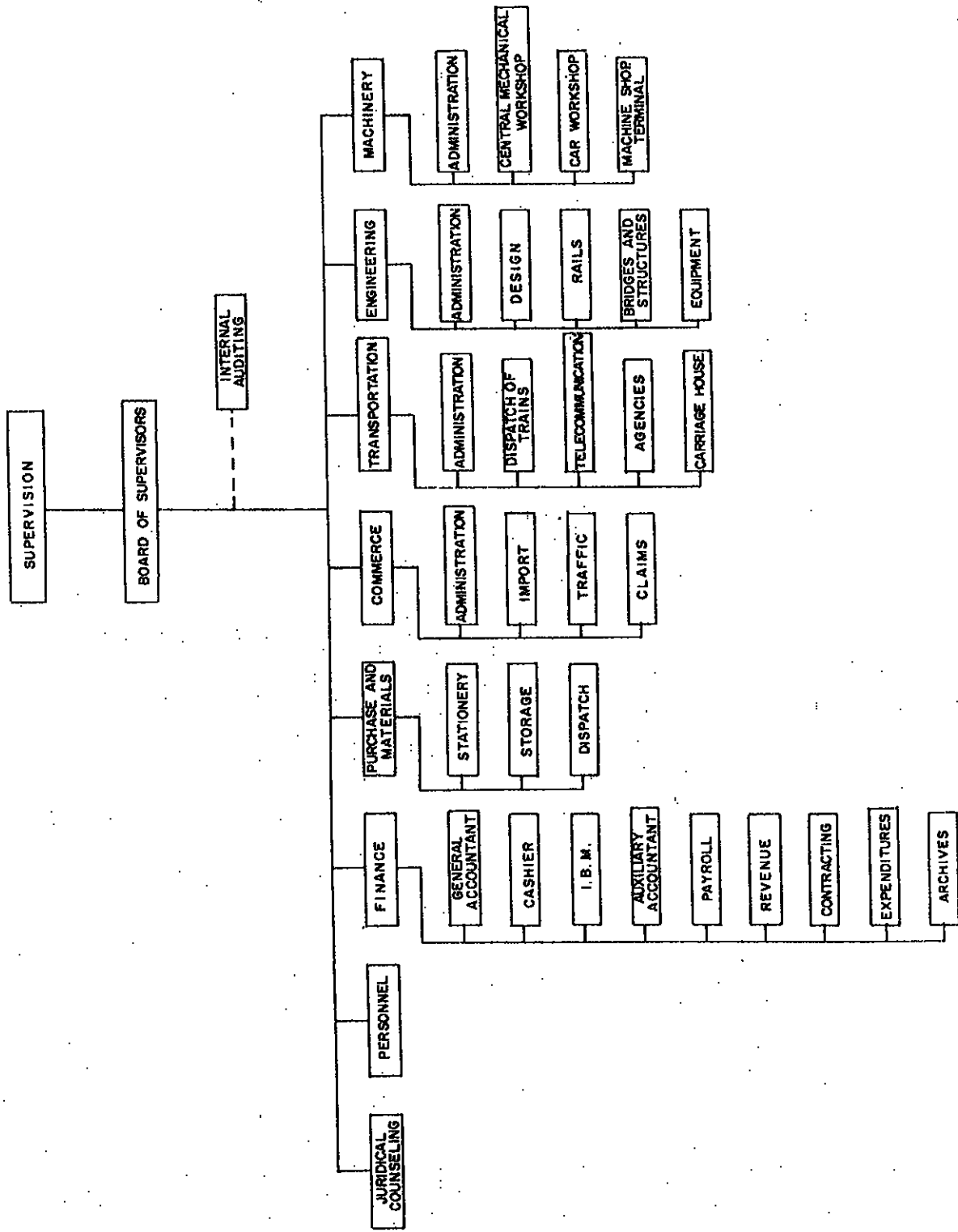


Fig. 7-5 ORGANIZATION OF FEGUA

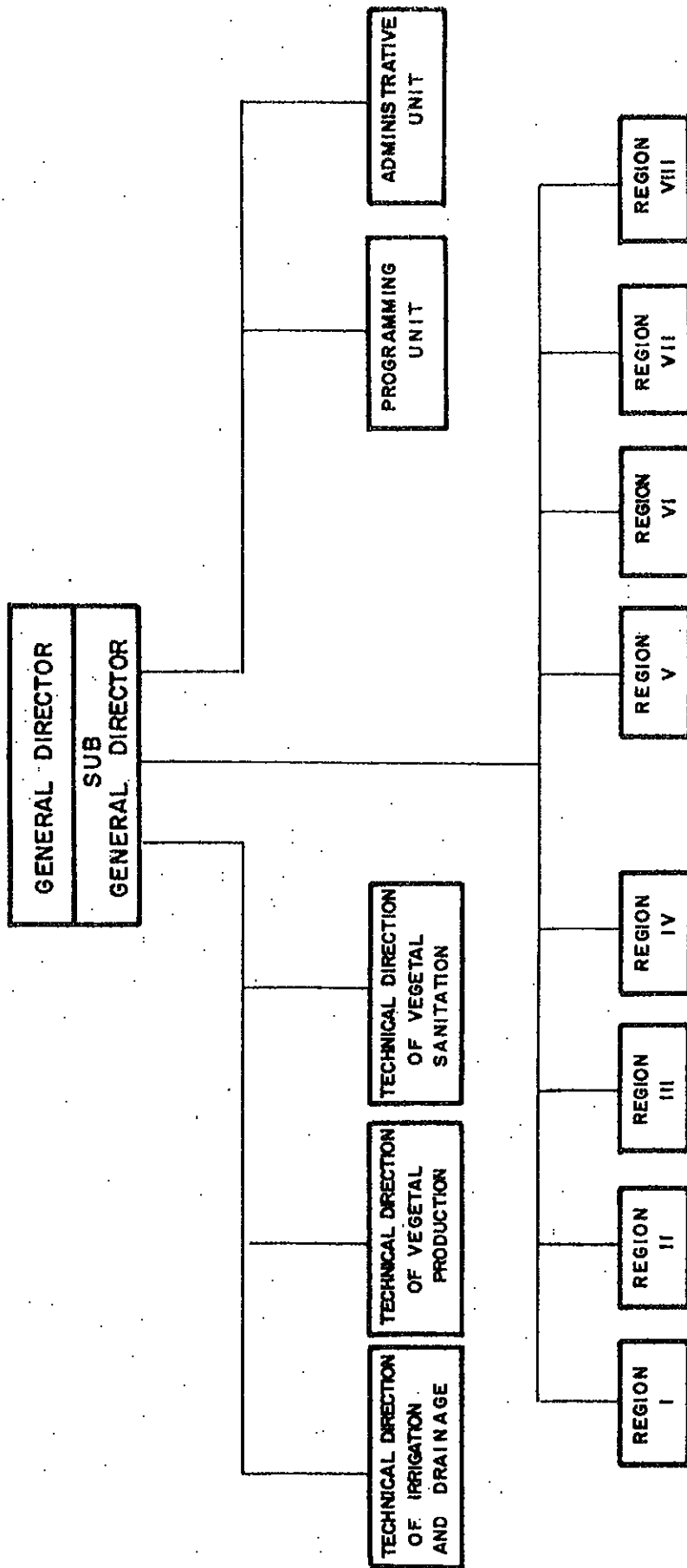


Fig. 7-6 ORGANIZATION CHART OF DIGESA

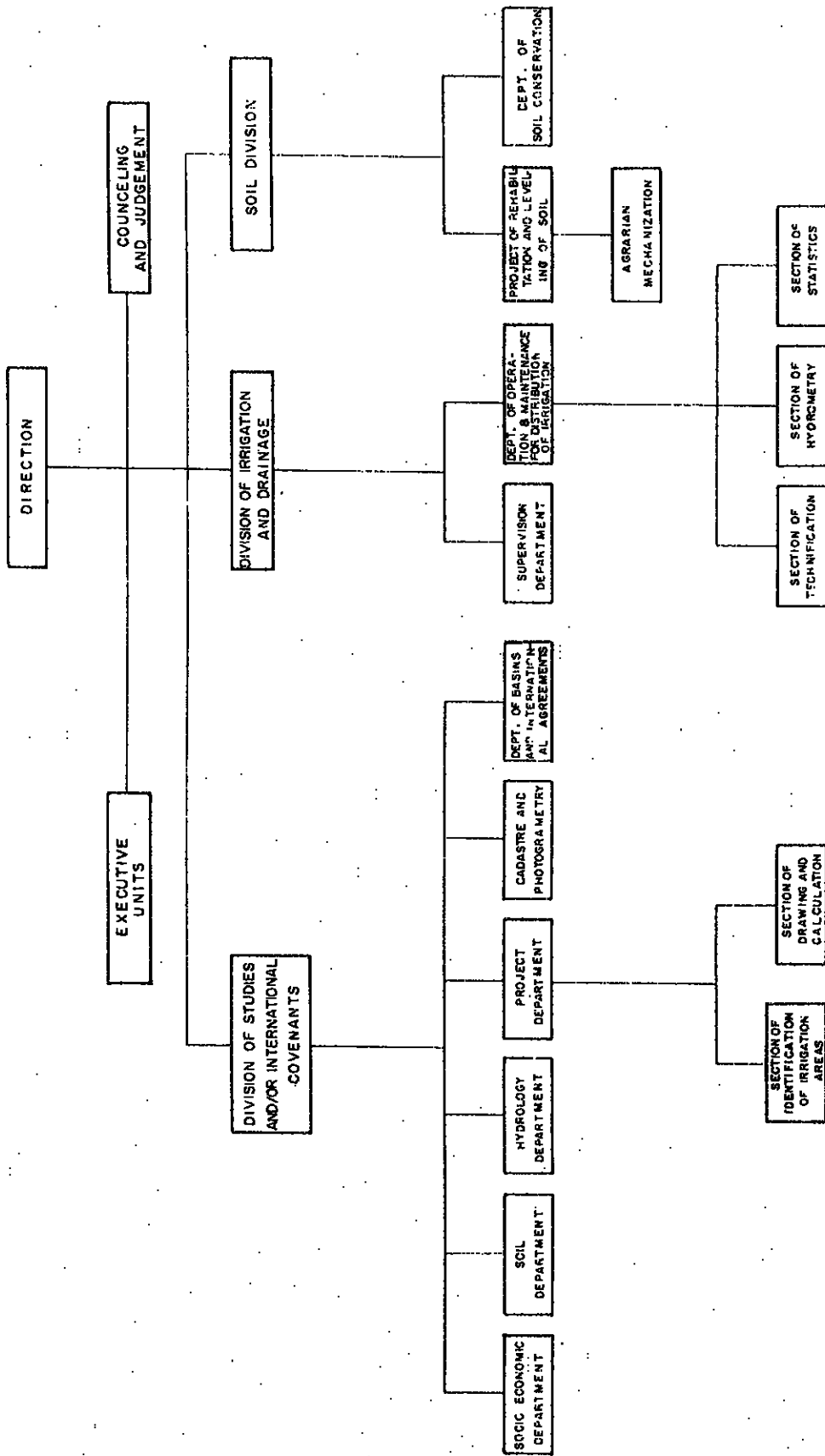


Fig. 7-7 ORGANIZATION CHART OF DIRYA

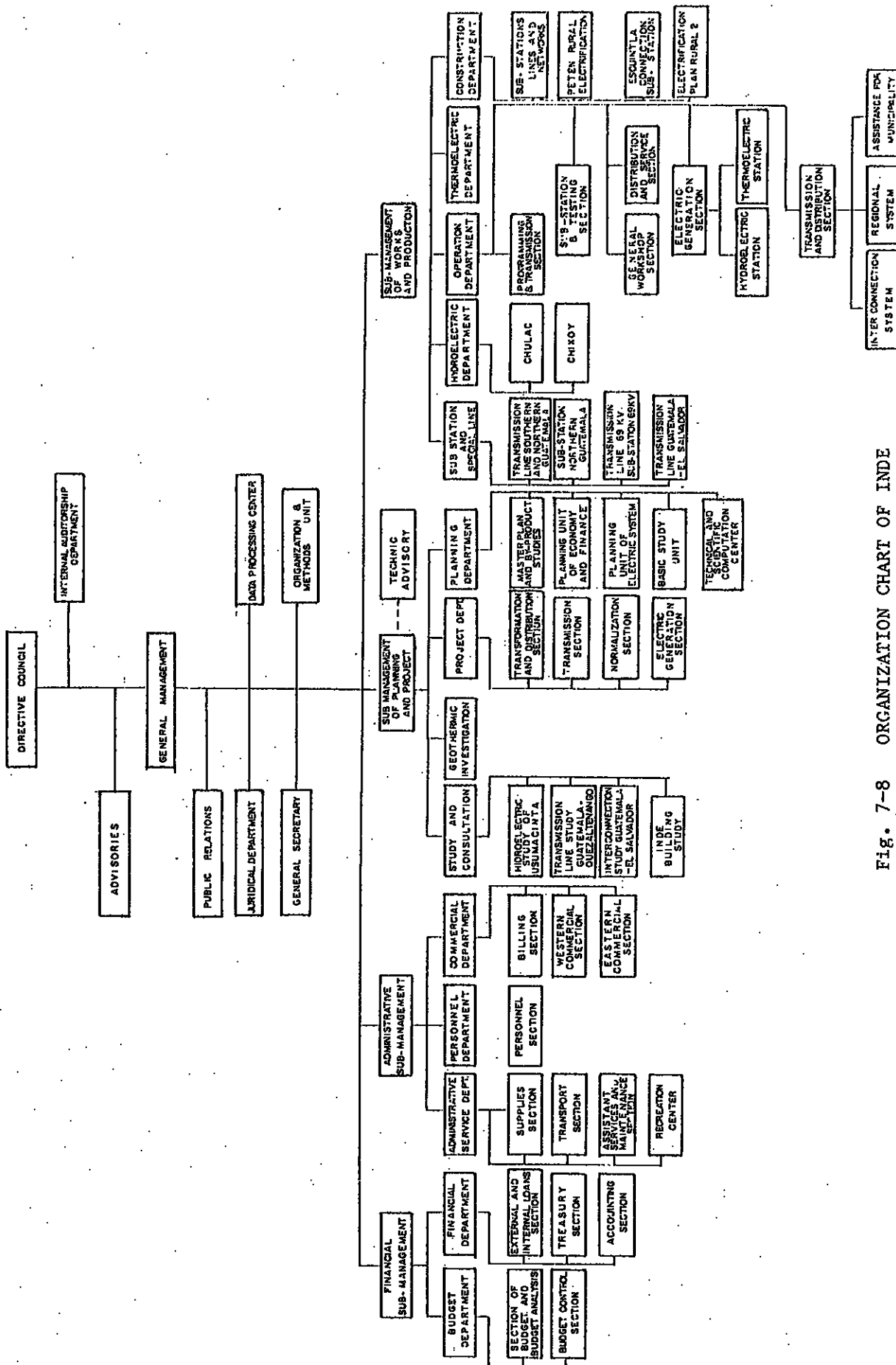


Fig. 7-8 ORGANIZATION CHART OF INDE

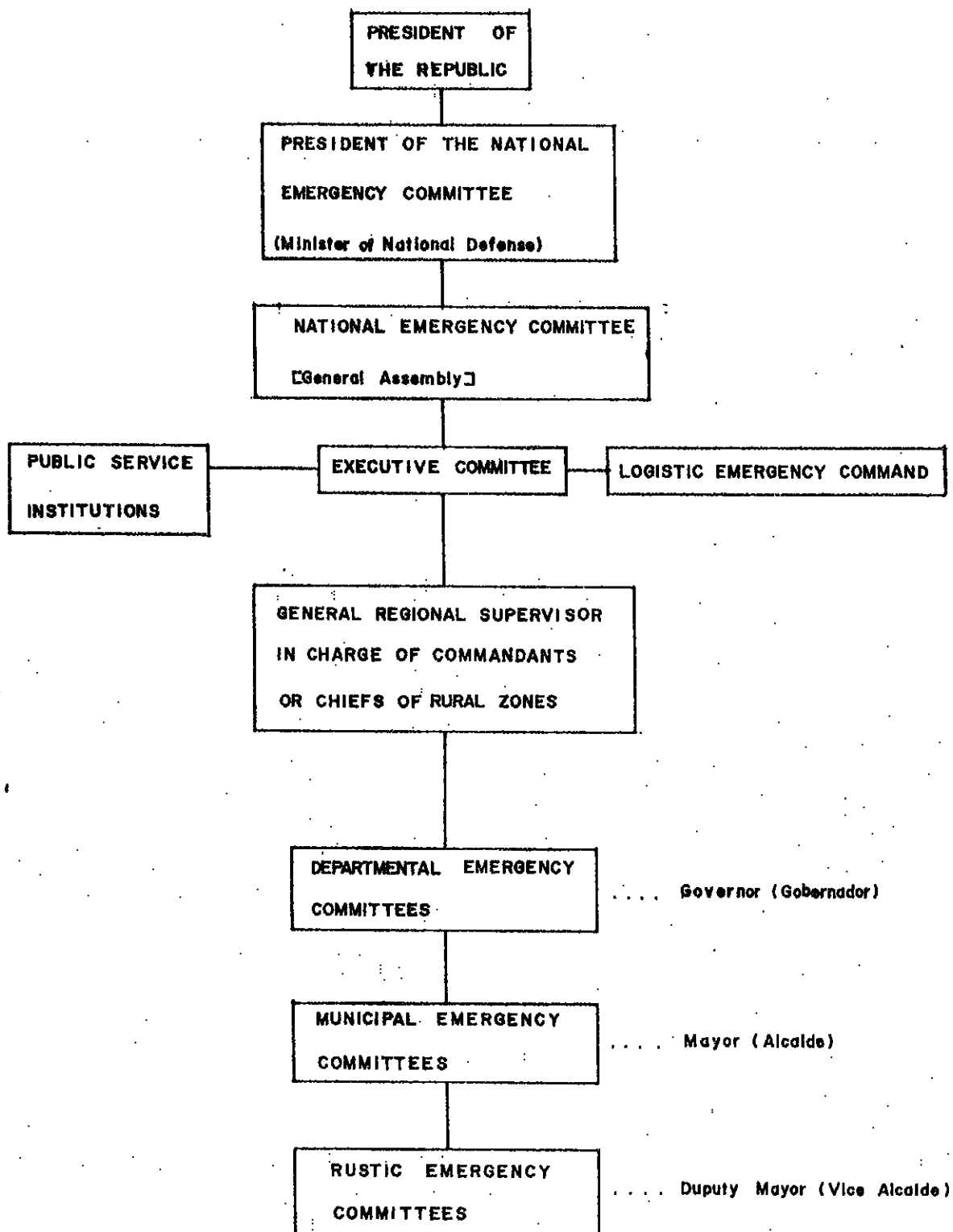


Fig. 7-9 ORGANIZATION CHART OF CONE

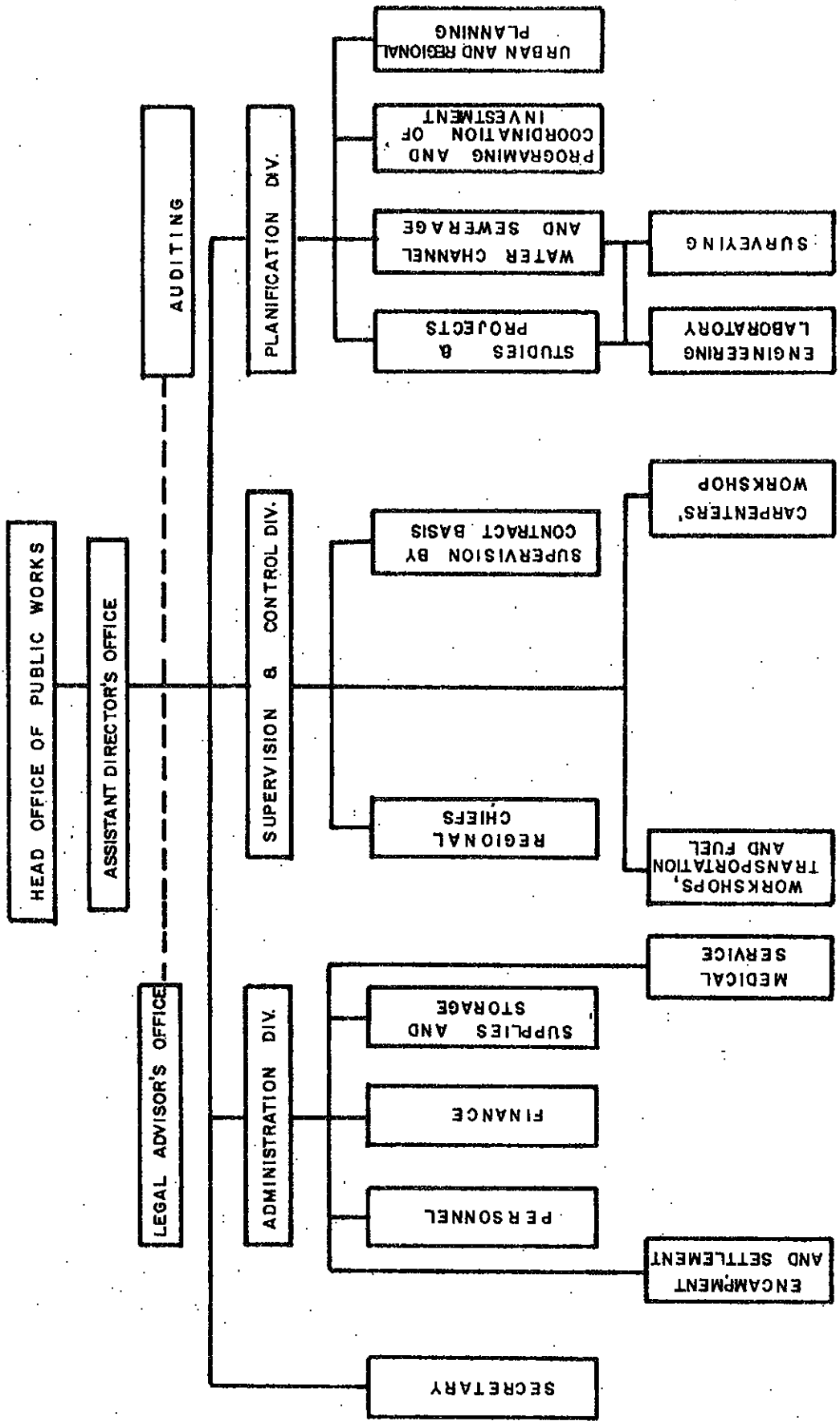


Fig. 7-10 ORGANIZATION CHART OF DGOP

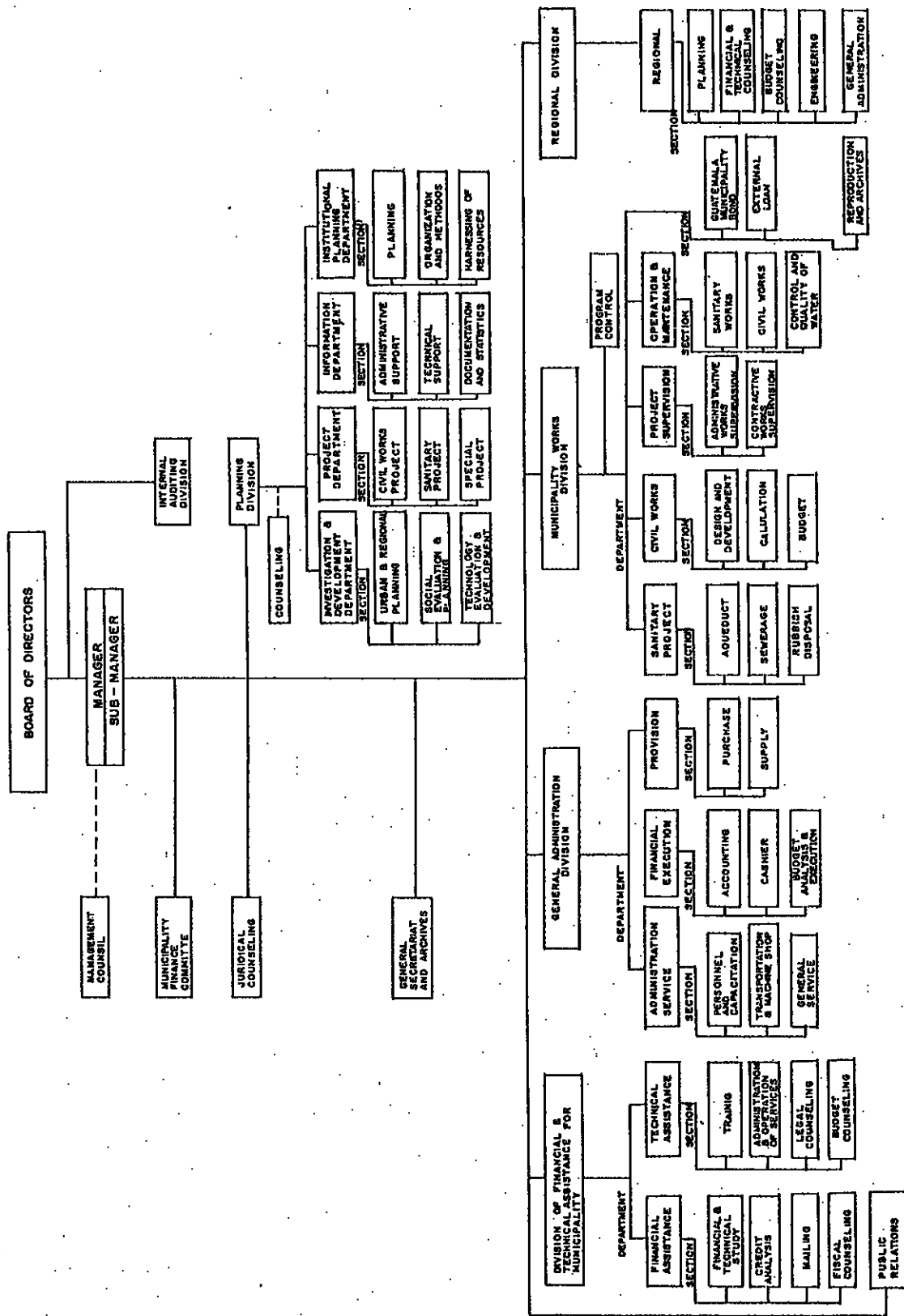


Fig. 7-11 ORGANIZATION CHART OF INFOM

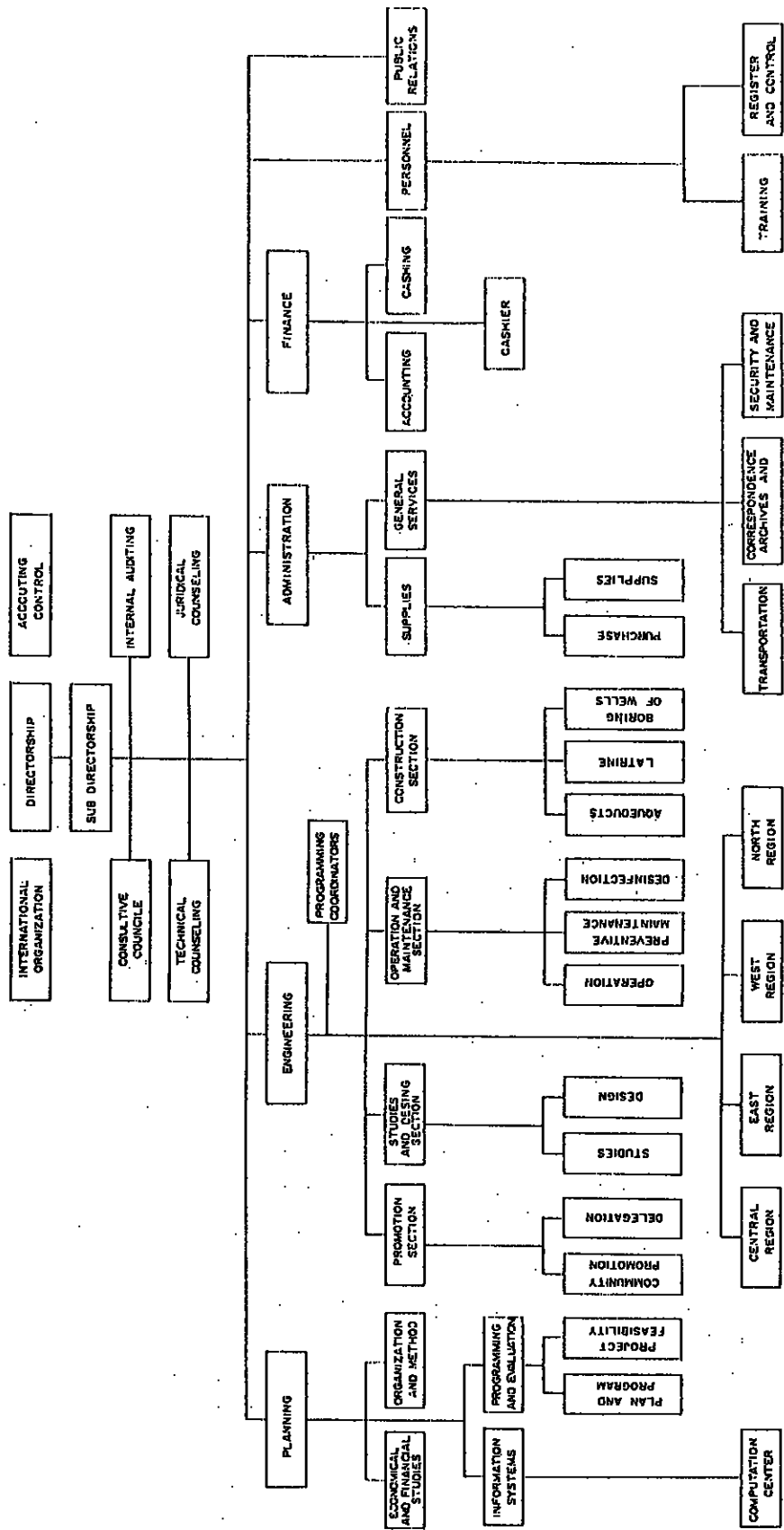


Fig. 7-12 ORGANIZATION CHART OF UNEPAR

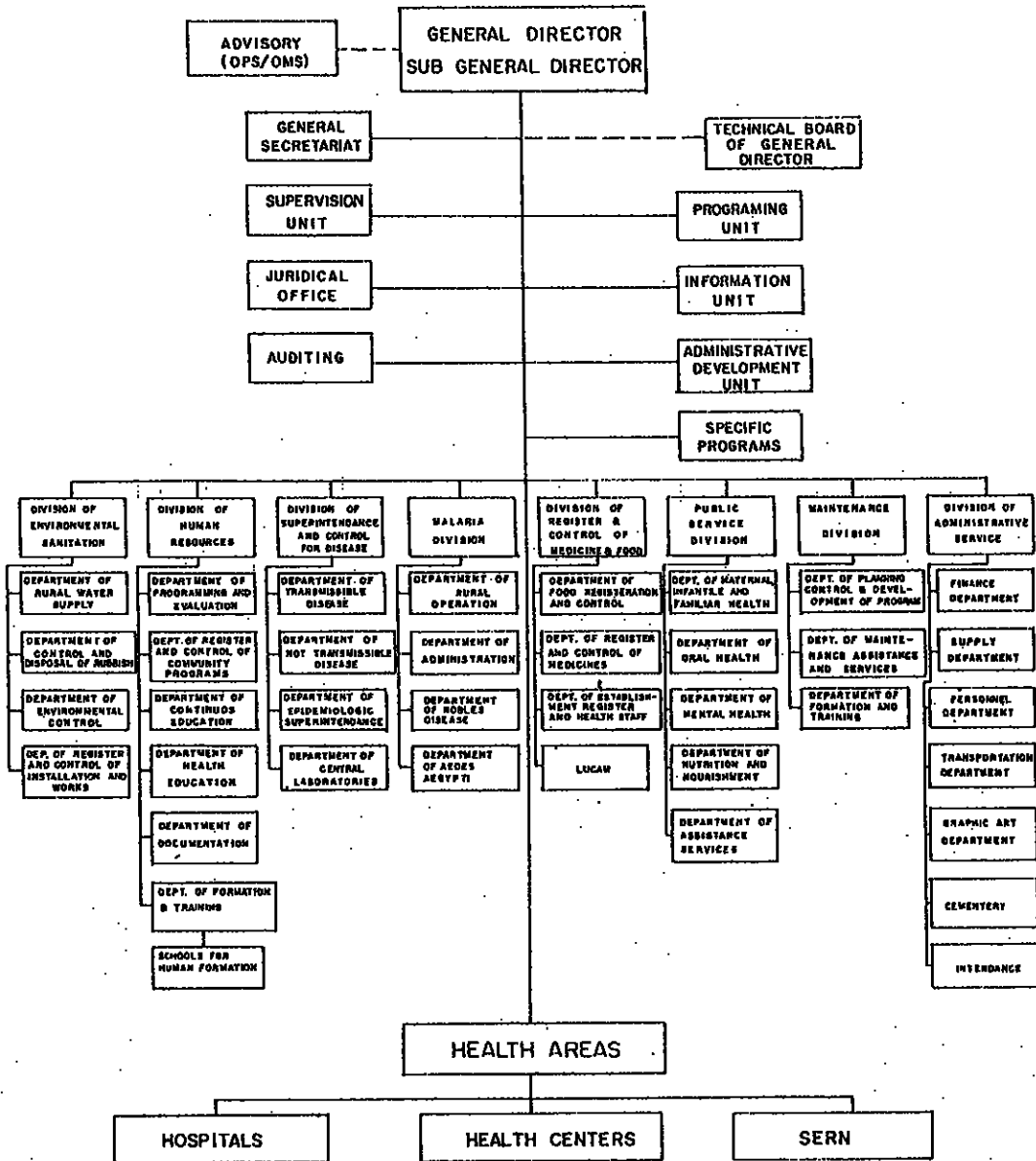


Fig. 7-13 ORGANIZATION CHART OF DGSS

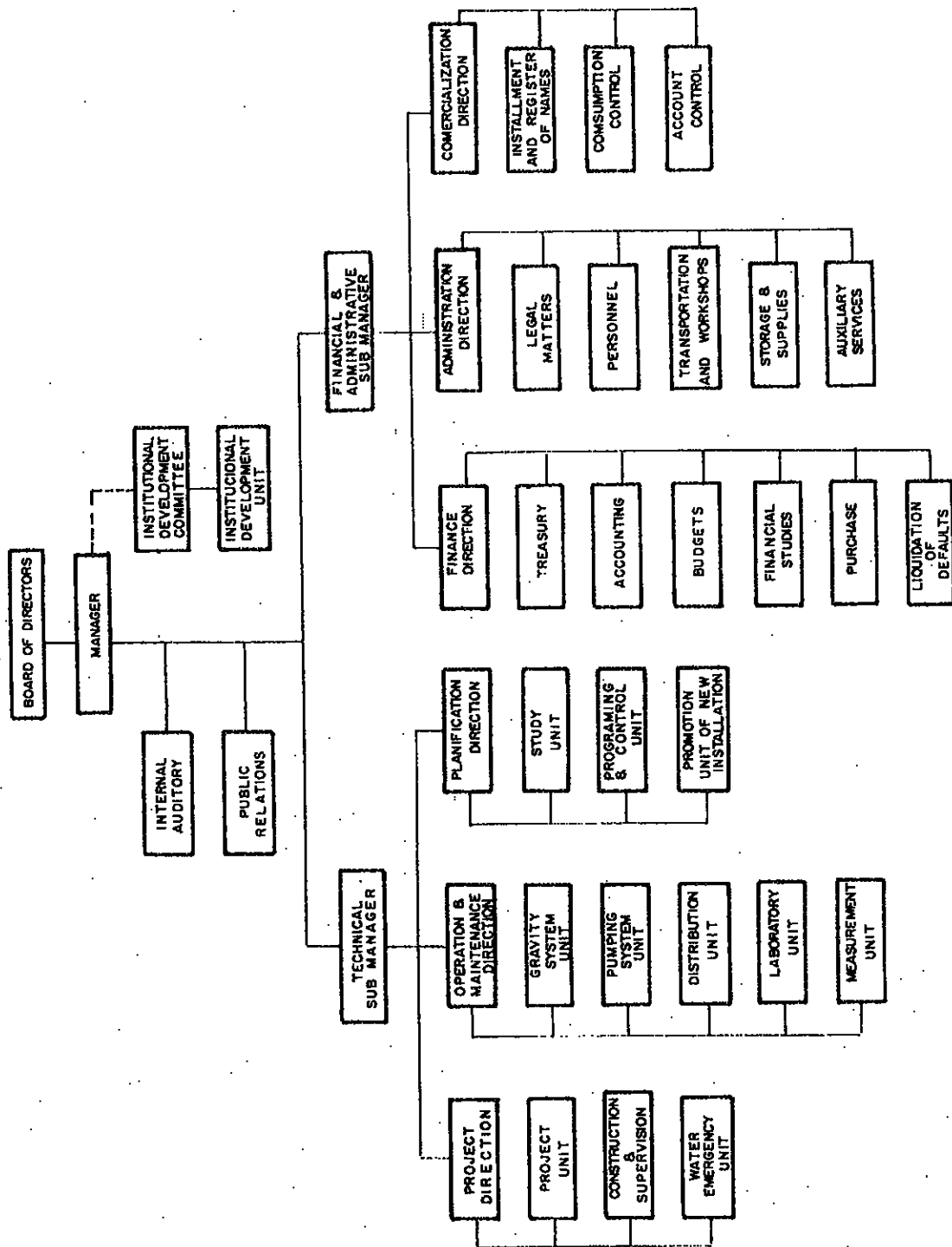


Fig. 7-14 ORGANIZATION CHART OF EMPACUA

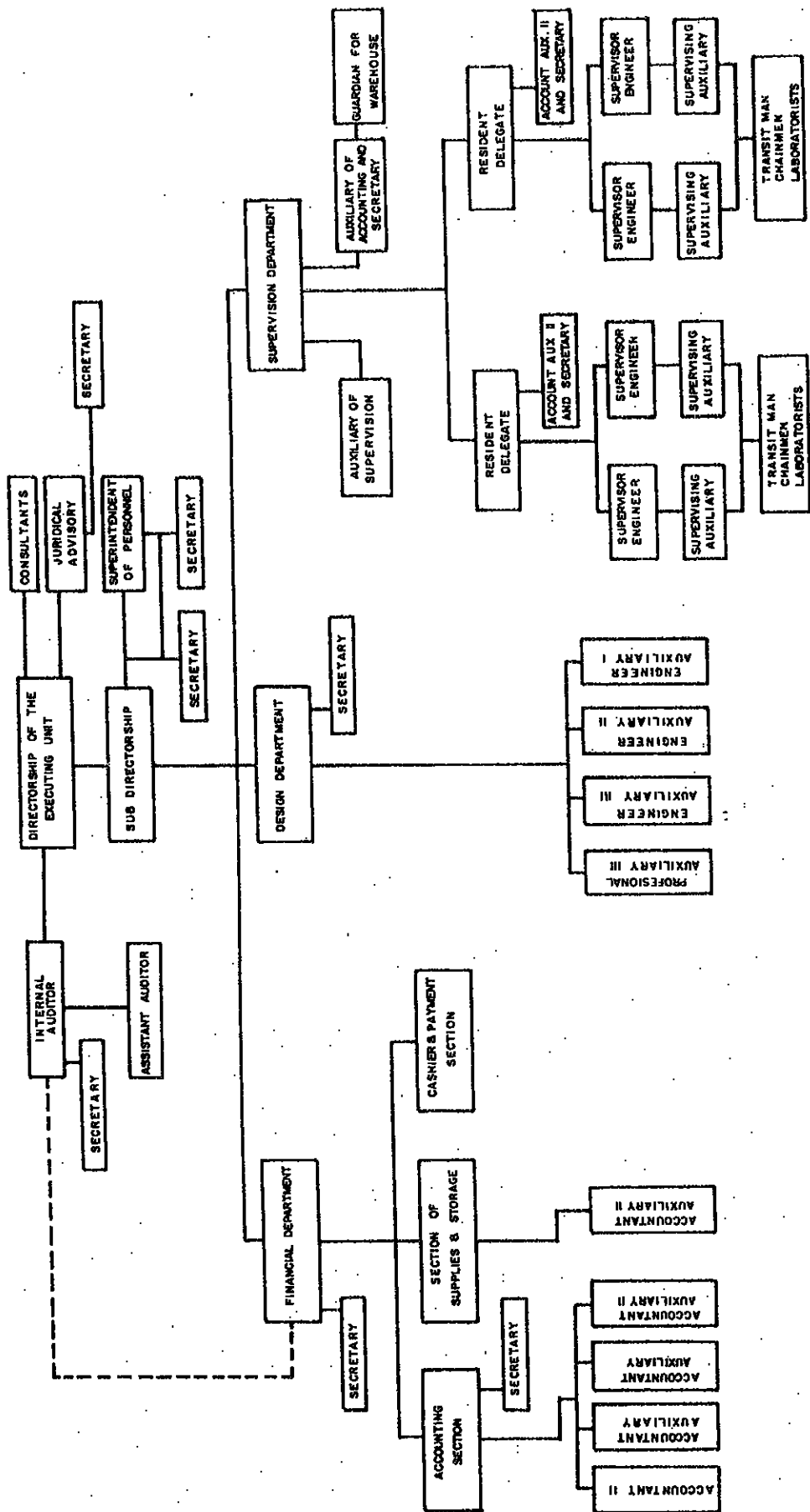


Fig. 7-15 ORGANIZATION CHART OF XAYA-PIXCAYA

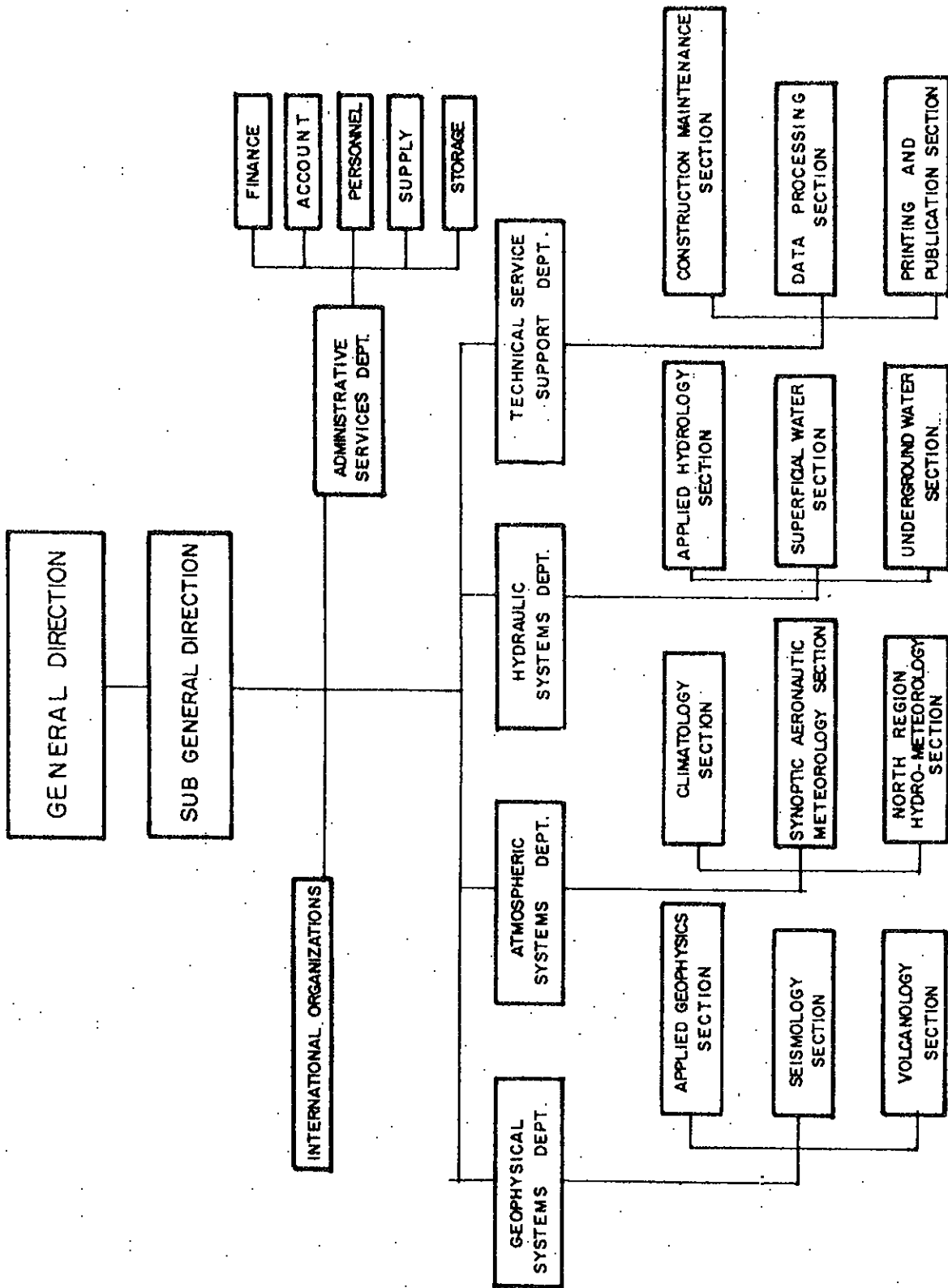


Fig. 7-16 ORGANIZATION CHART OF INSIVUMEH

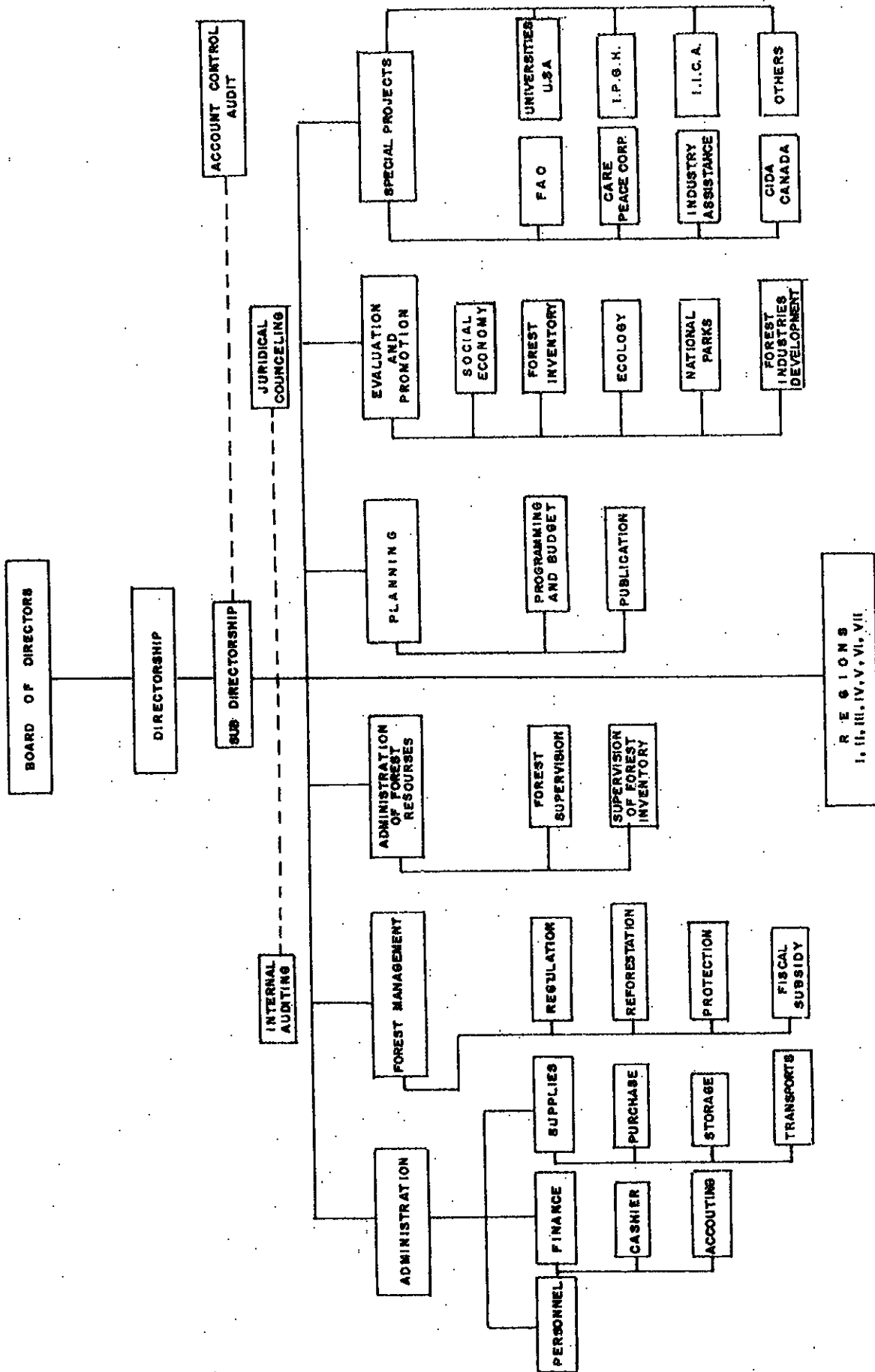


Fig. 7-17 ORGANIZATION CHART OF INAFOR

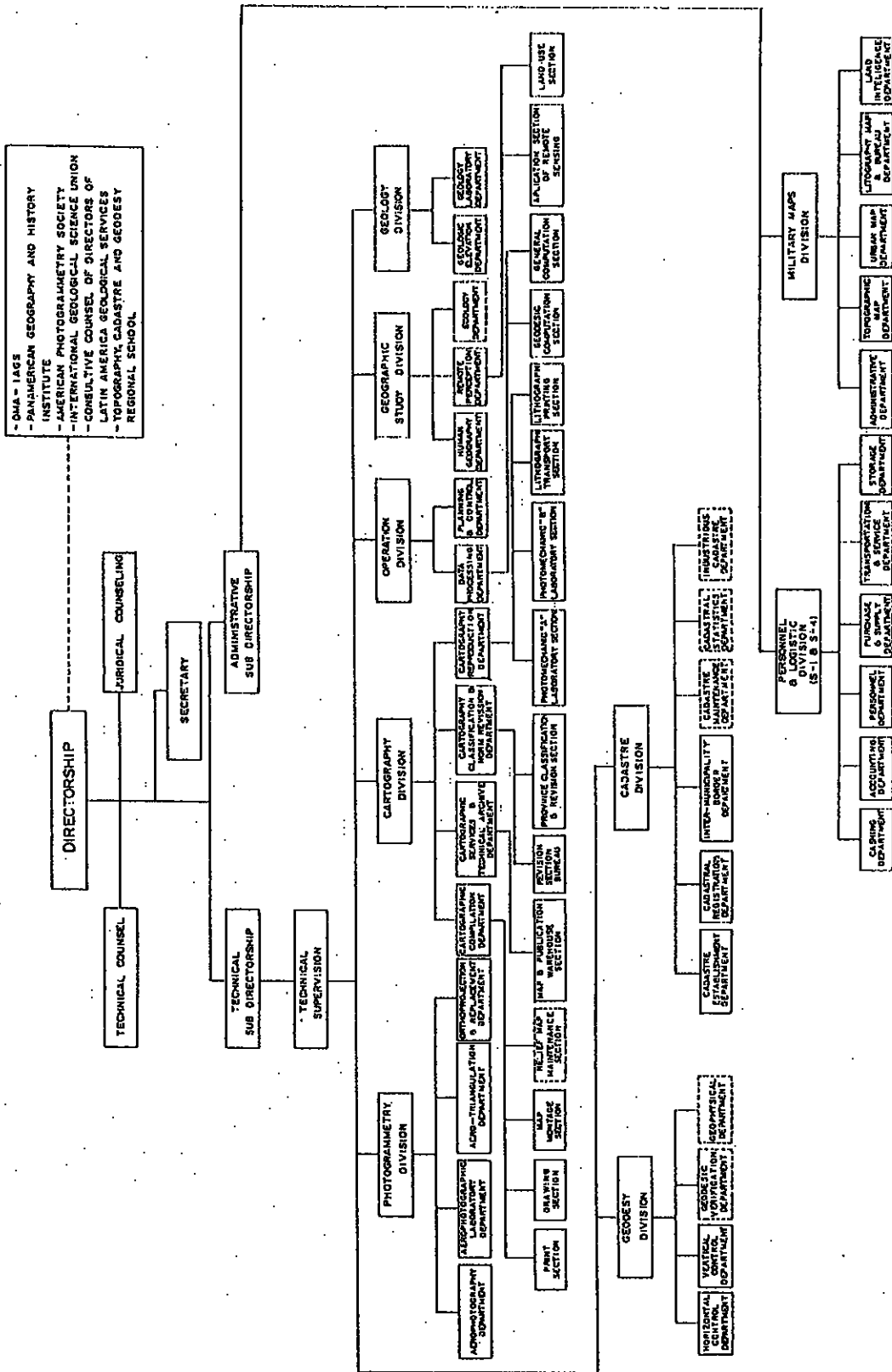


Fig. 7-18 ORGANIZATION CHART OF GIM

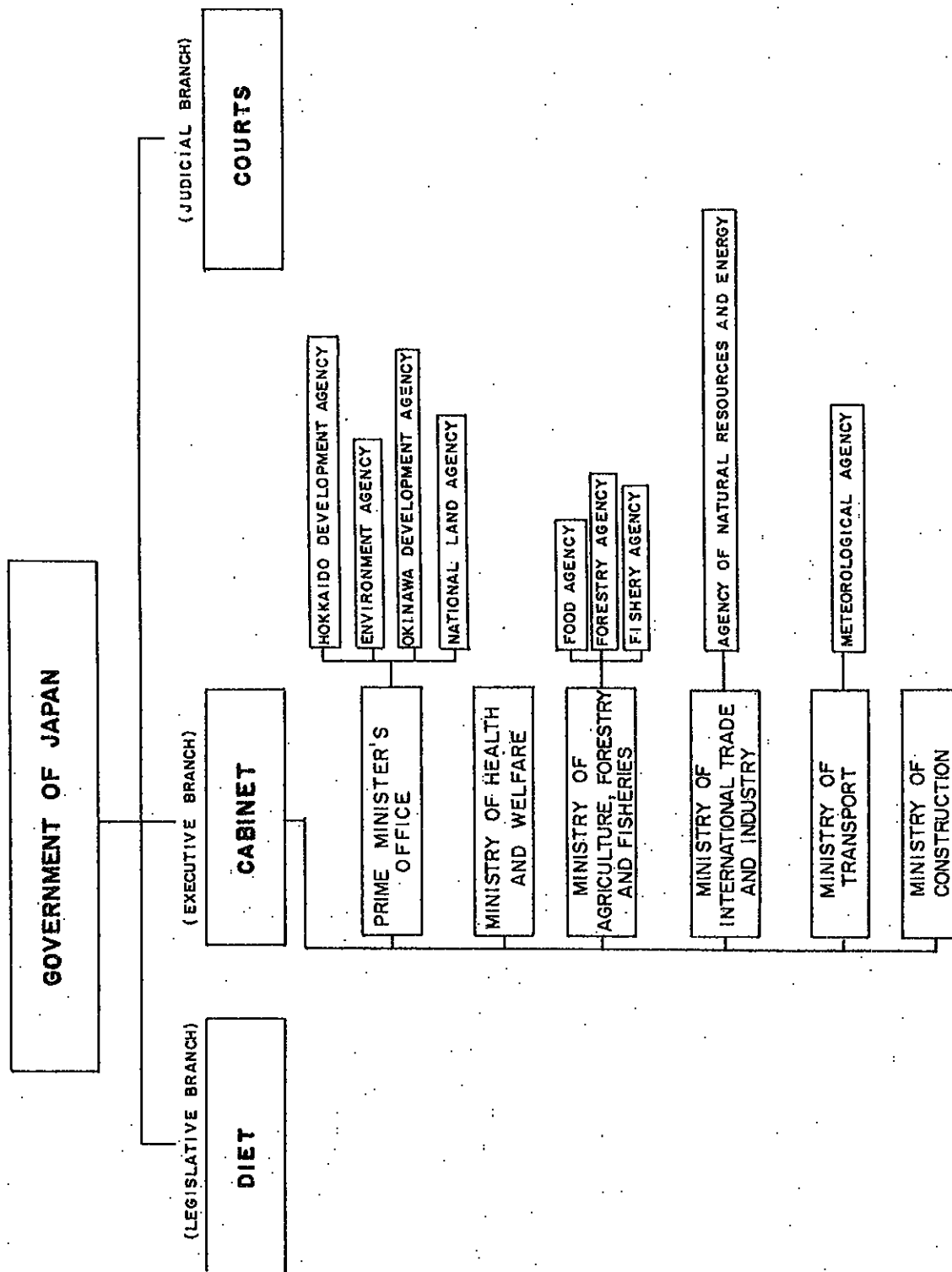


Fig. 7-19 ADMINISTRATIVE ORGANIZATION RELATED TO WATER MANAGEMENT IN JAPAN

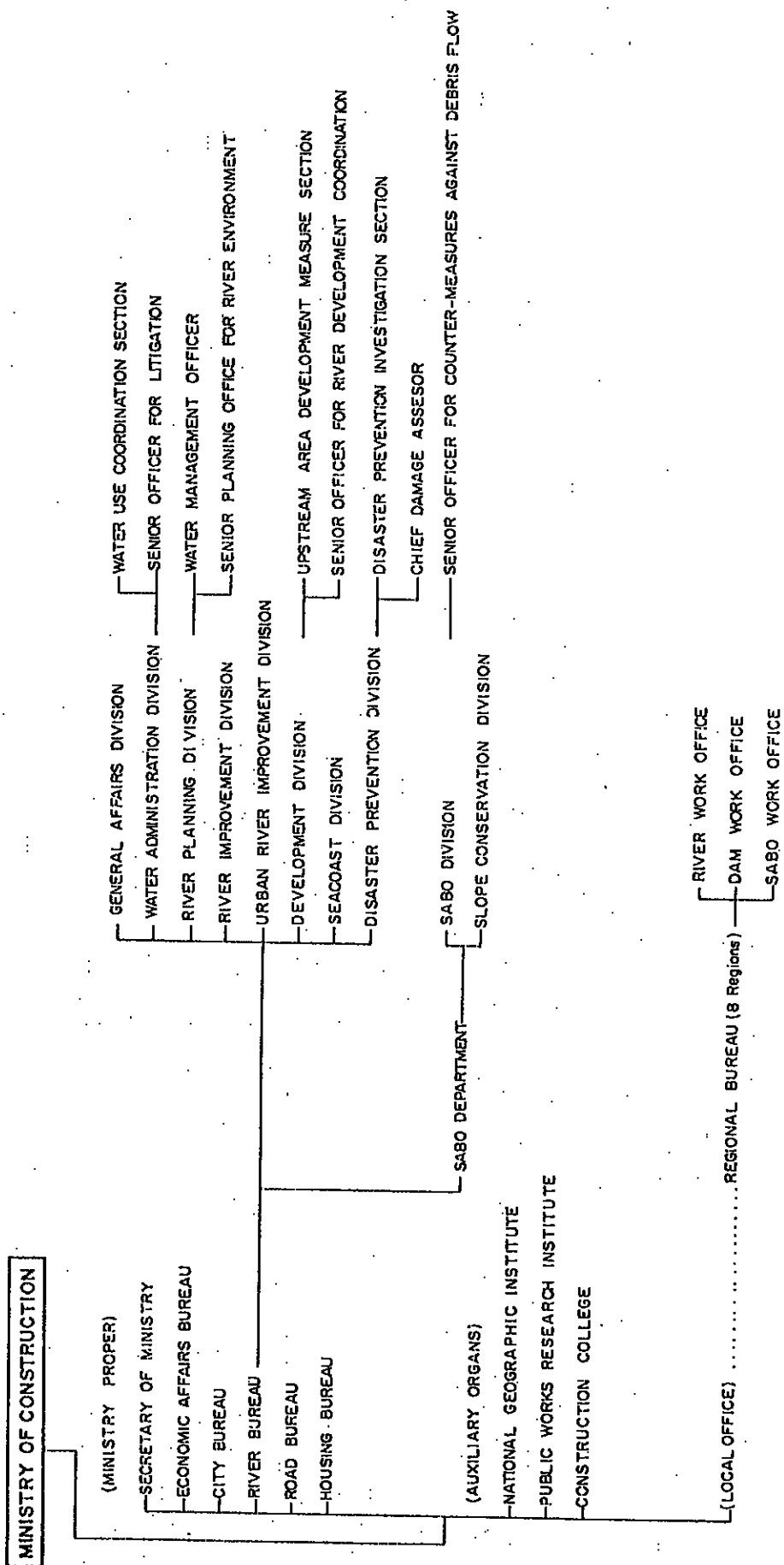


Fig. 7-20 ORGANIZATION CHART OF THE MINISTRY OF CONSTRUCTION WITH BREAKDOWN OF ITS RIVER BUREAU

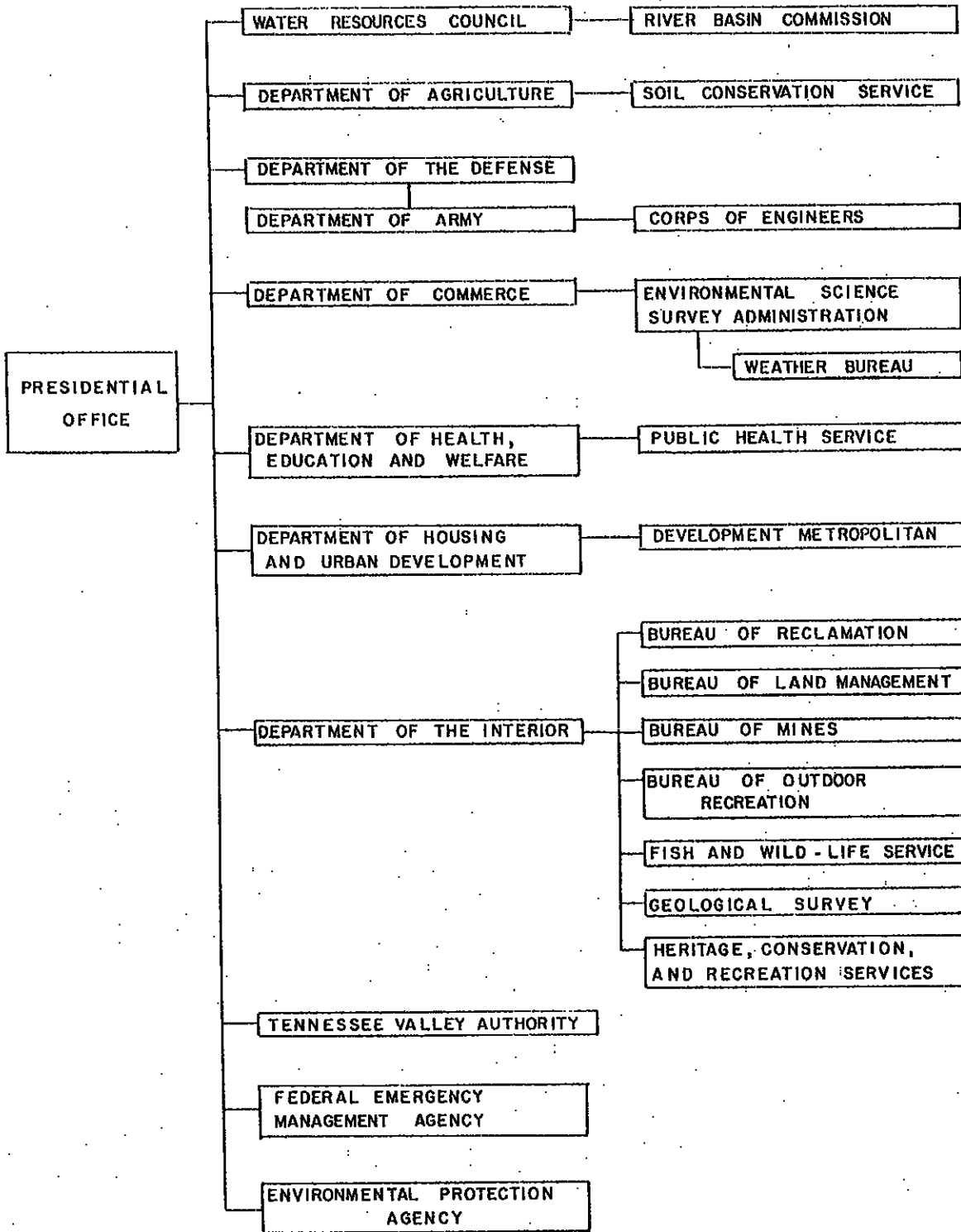


Fig. 7-21 ADMINISTRATIVE ORGANIZATION RELATED TO WATER MANAGEMENT IN THE UNITED STATES OF AMERICA

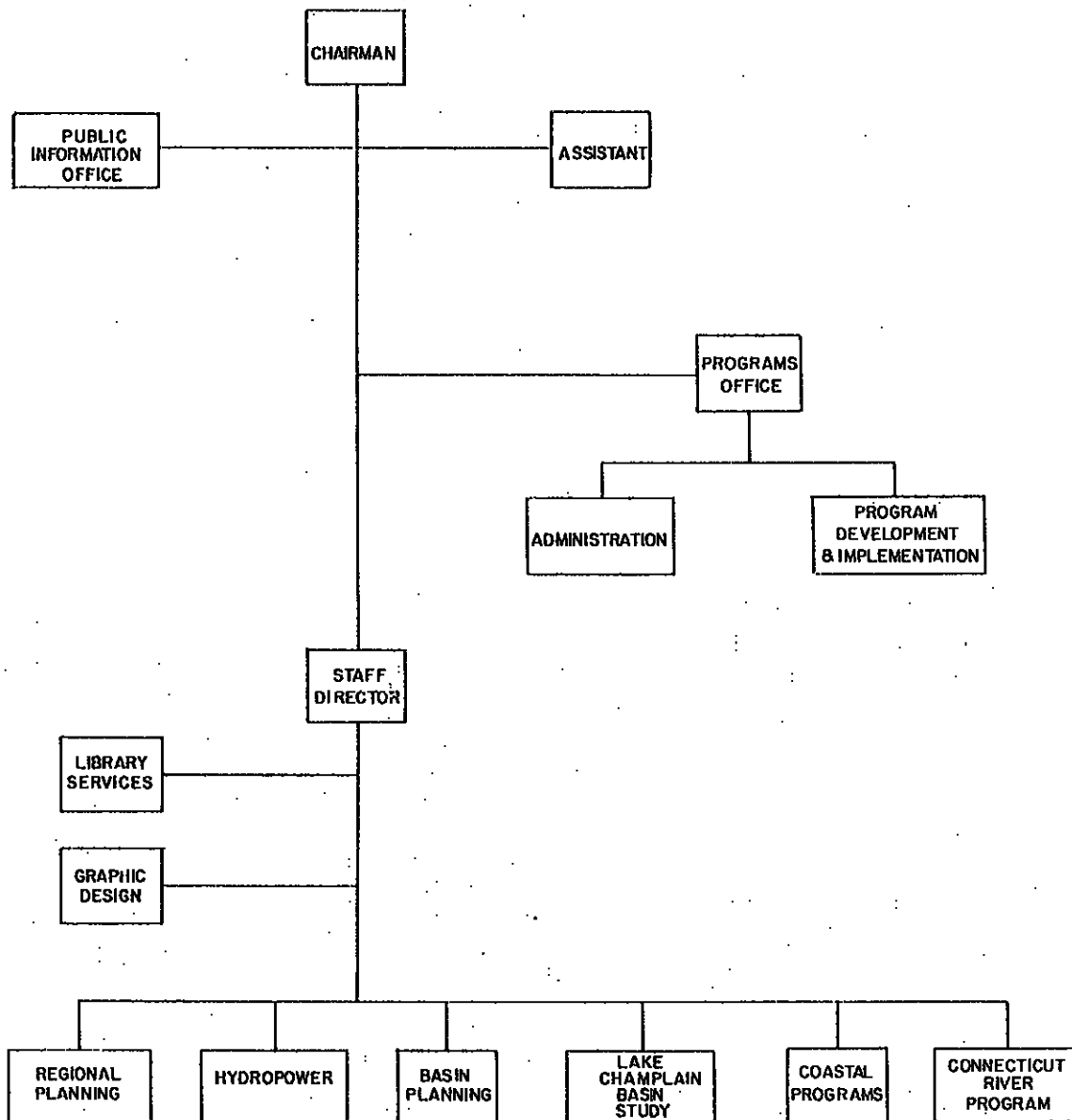


Fig. 7-22 ORGANIZATION CHART OF THE NEW ENGLAND RIVER BASIN COMMISSION

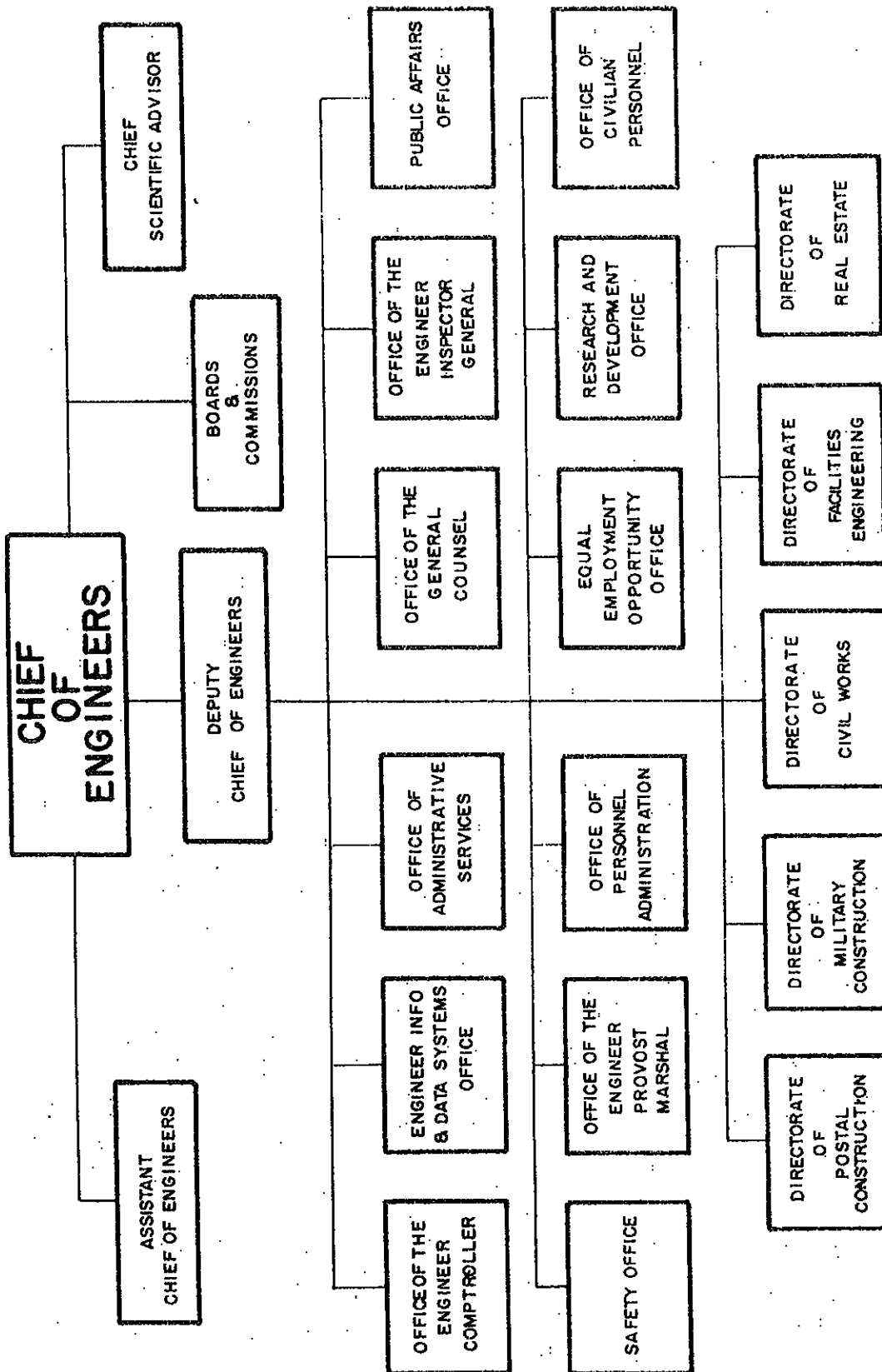


Fig. 7-23 ORGANIZATION CHART OF THE OFFICE OF THE CHIEF OF ENGINEERS

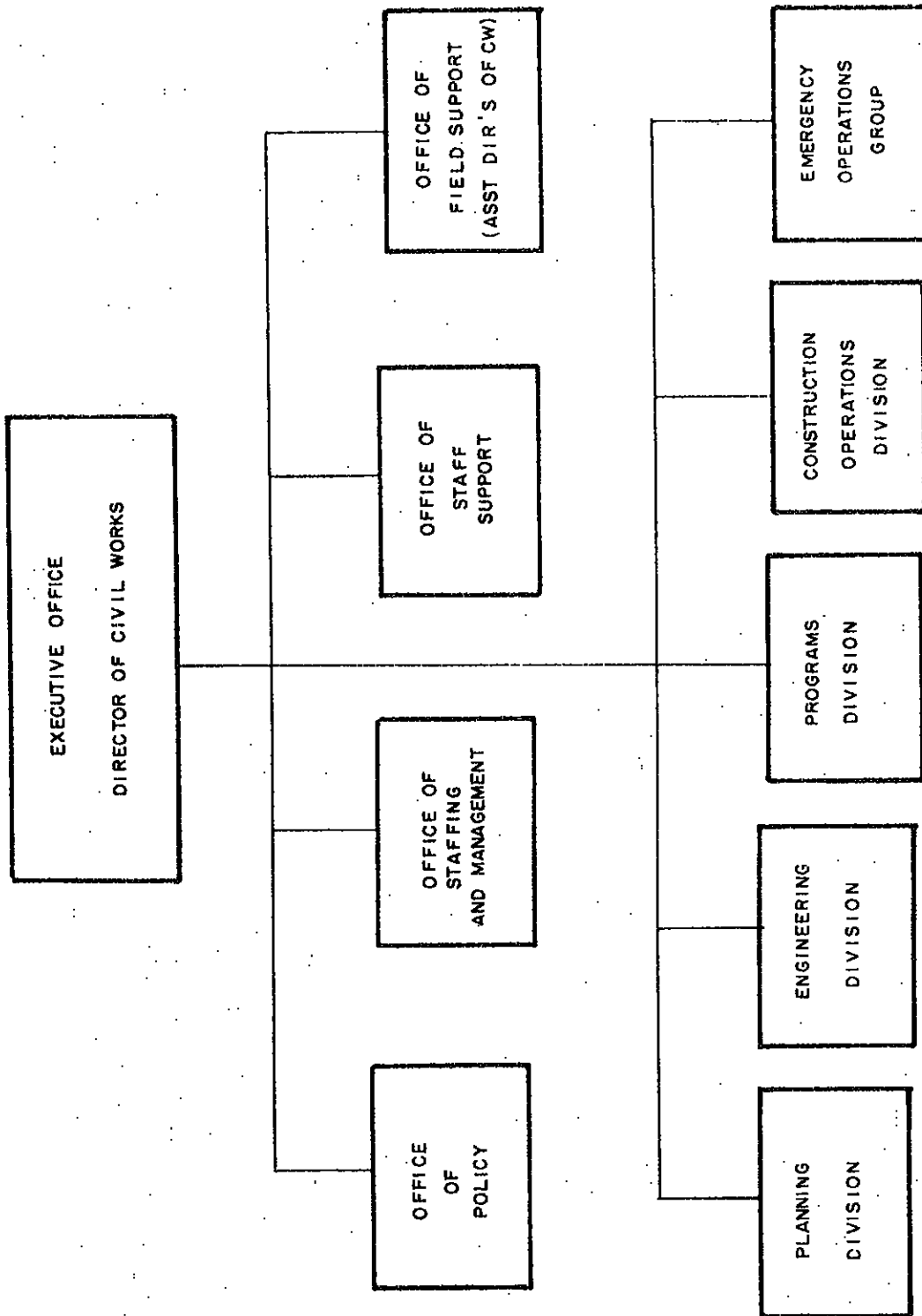


Fig. 7-24 ORGANIZATION CHART OF THE DIRECTORATE OF CIVIL WORKS

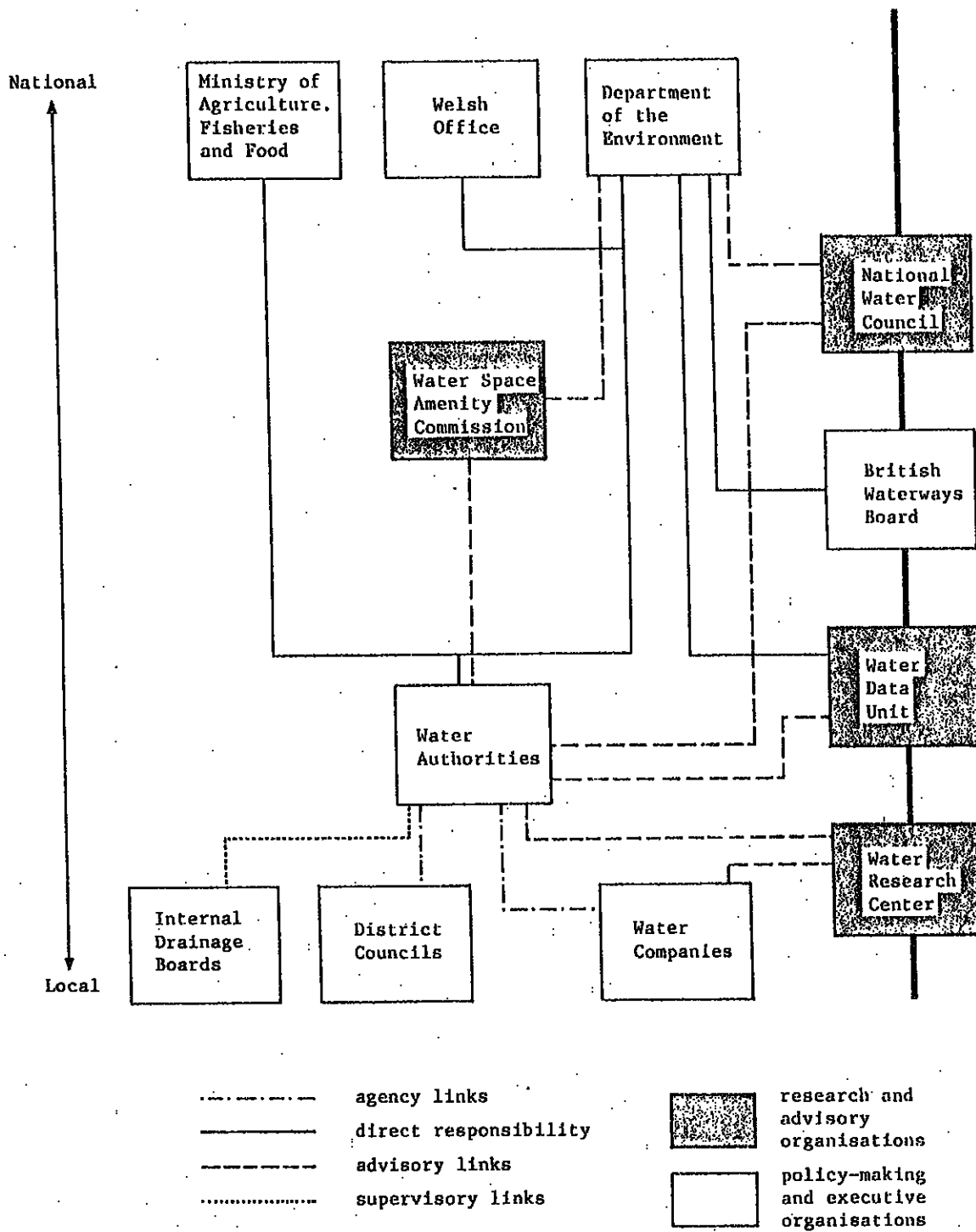


Fig. 7-25 ADMINISTRATIVE ORGANIZATION RELATED TO WATER MANAGEMENT IN THE UNITED KINGDOM

COMMITTEE STRUCTURE

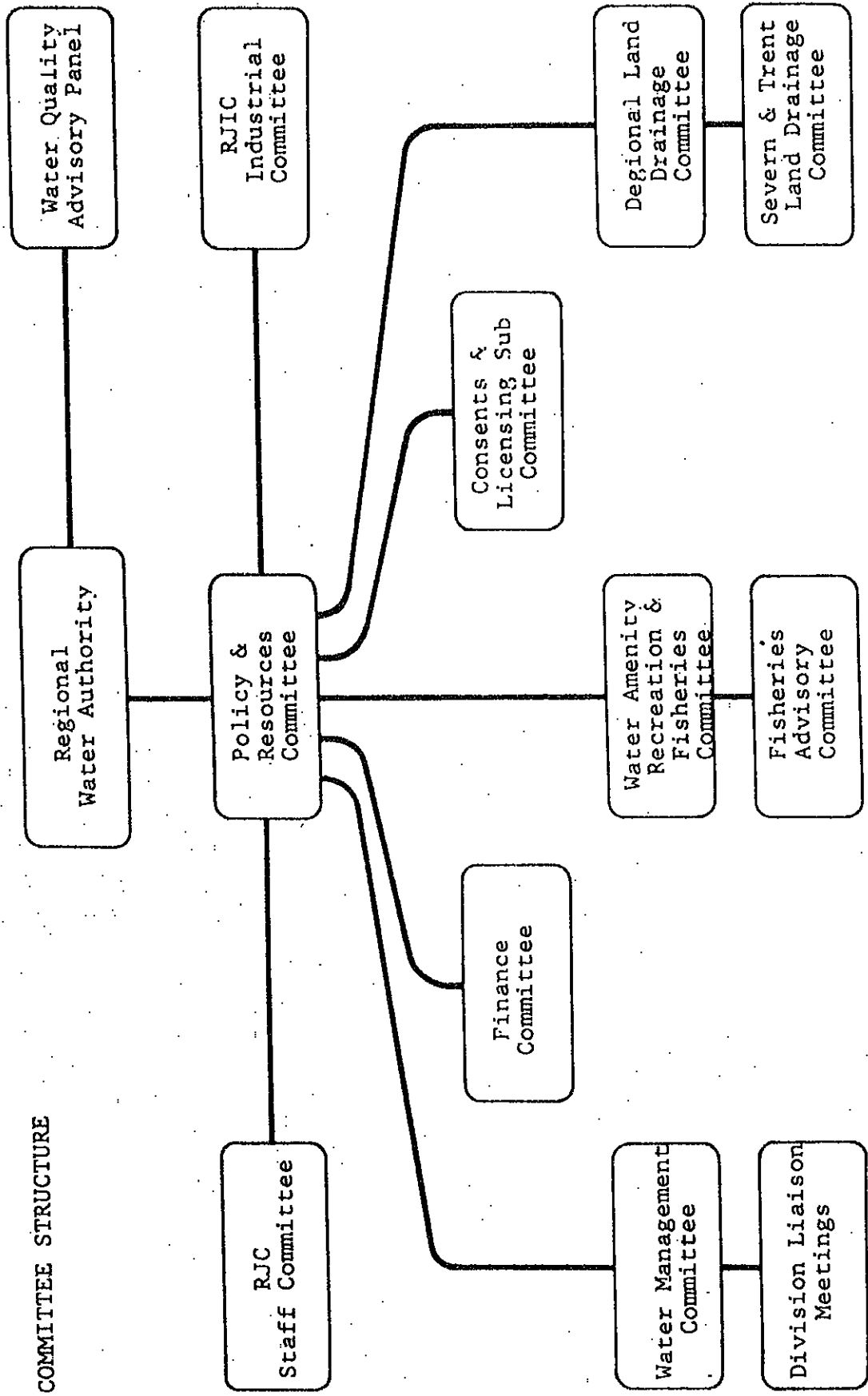


Fig. 7-26 (1/2) OPERATIONAL ORGANIZATION OF THE SEVERN TRENT WATER AUTHORITY

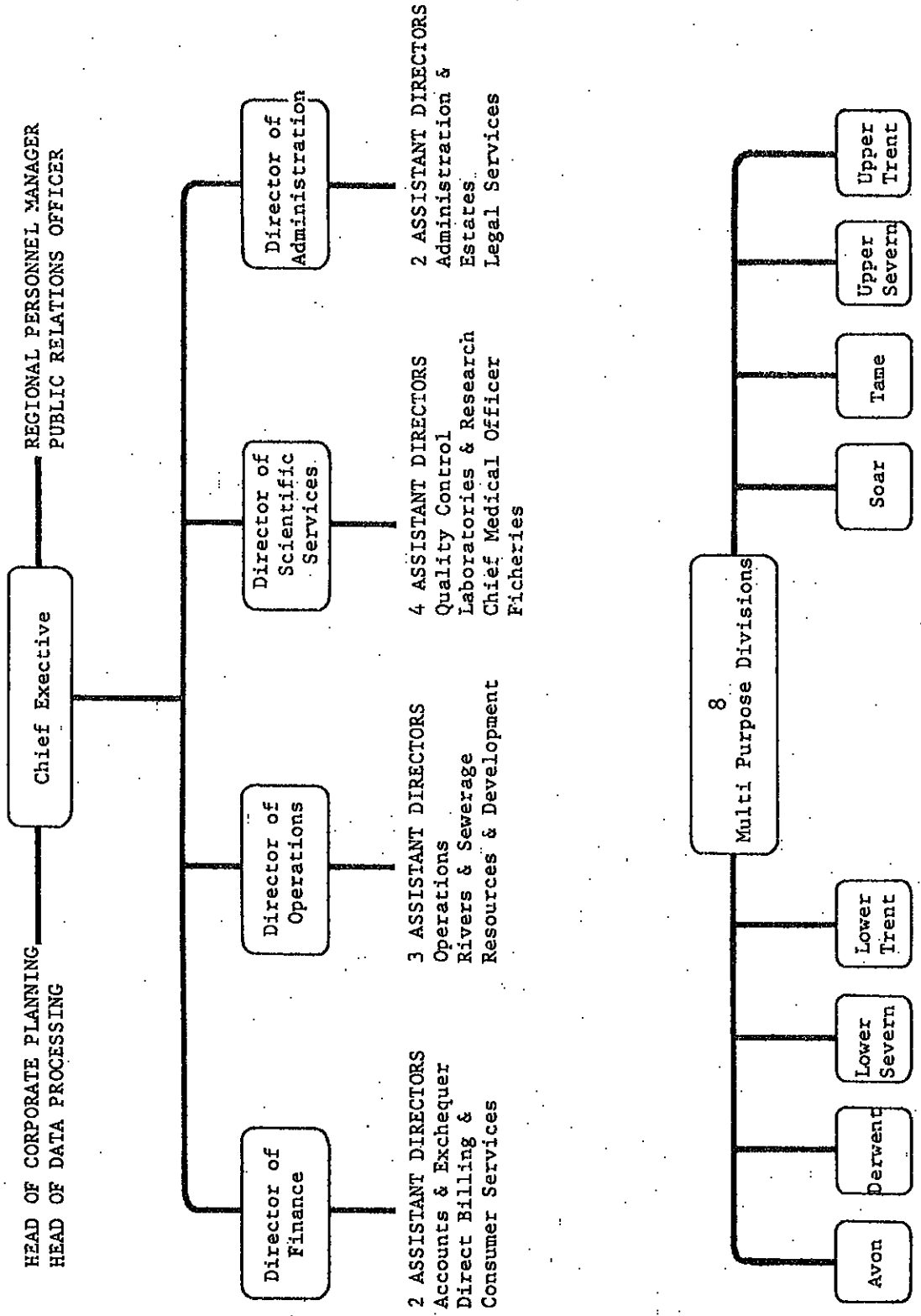


Fig. 7-26 (2/2) OPERATIONAL ORGANIZATION OF THE SEVERN TRENT WATER AUTHORITY

JICA